HG

A compendium of hyperological papers (Tiers I, II and III)

General Hyperological Principles [GHP]

Hyperological Community

June 1, 2022

The purpose of this document and the **GHP** framework is to articulate and concretize the methodology and background assumptions behind hyperology. If you are not already familiar with the overall concept of what hyperology is, please refer to the document *"Hyperology.pdf"*.

GHP doesn't rule out the mechanisms behind most hyperological fallacies, for the list of hyperological fallacies, please refer to the document *"HyperFallacies.pdf"*.

Metaprinciple

P0. Any hyperologically significant term used within principles of **GHP** such as "logic", "metaphysics" or "all" should not be interpreted by their hyperological meanings, and thus, principles of **GHP** cannot be hyperologically transcended.

(example: a hyperological structure defined to be "too vast for GM3 or GL2 to hold" is not metahyperologically-sound)

Principles of Mundanity

These principles concern basic hyperological stances on everyday life. [Fig. 1]

M1. Mundane Real Life [**MRL**] is the world we — human beings live in, it exists in some way and is a meaningful thing to consider and bring up in a conversation.

(Hyperology is incompatible with extreme forms of metaphysical, semantic or logical nihilism)

M2. **MRL** is a notion which needs no extra clarification beyond what is stated in **M1**.

(Exact nature of **MRL** is hyperologically insignificant)

M3. Mundane Assumptions [**MA**] are assumptions about **MRL** which are necessary for humans to believe or, at least, pragmatically assume, in order to function reasonably within **MRL**.

M4. **MA** are things which any hyperologist should assume while engaging in the activity of hyperology.

(It is never hyperologically productive to assume that any subset of **MA** is false. Hyperology is not a mysticist or anti-scientific practice)

Figure 1: Example of an event in **MRL**.

Principles of Anti-Formality

These principles concern the relation between hyperology and formal sciences. [Fig. 2]

AF1. There exists neither a *reasonable* nor a *meaningful* reduction of hyperology to an algorithmically-determined game of formal string manipulation.

(reasonable: feasible in practice;
meaningful: preserving intended meaning of terms)

AF2. There exists a reduction of all hyperology which will ever be performed by all hyperologists in **MRL** to an algorithmically-determined game of formal, finitary string manipulation. Such reductions of hyperology shall be notated as Hyperologically-Reductive Formalisms [**HRF**].

(as stated in **AF1**, **HRF**s are neither reasonable nor meaningful, yet their existence is nonetheless important to keep in mind)

AF3$_1$. Hyperology is not to be considered as a study of **HRF**s, instead, hyperologists should should assume[‡] the existence of hyperological concepts as if they are concrete, completed objects.

(It is never hyperologically productive to consider **HRF**s as intended semantics or logics behind hyperology. If you can't help but feel like hyperology is ultimately about **HRF**s, you most likely won't find hyperology meaningful or appealing)

AF3$_2$. Hyperologists should should assume[‡] the fact that the field of hyperology is the collection of all insights about those objects, regardless of whether this collection is realizable by a human individual or group.

(The most metaphysically "comfortable" stance on **HRF**s is that they could be indefinitely more complex, had **MRL** been an easier place to perform hyperology)

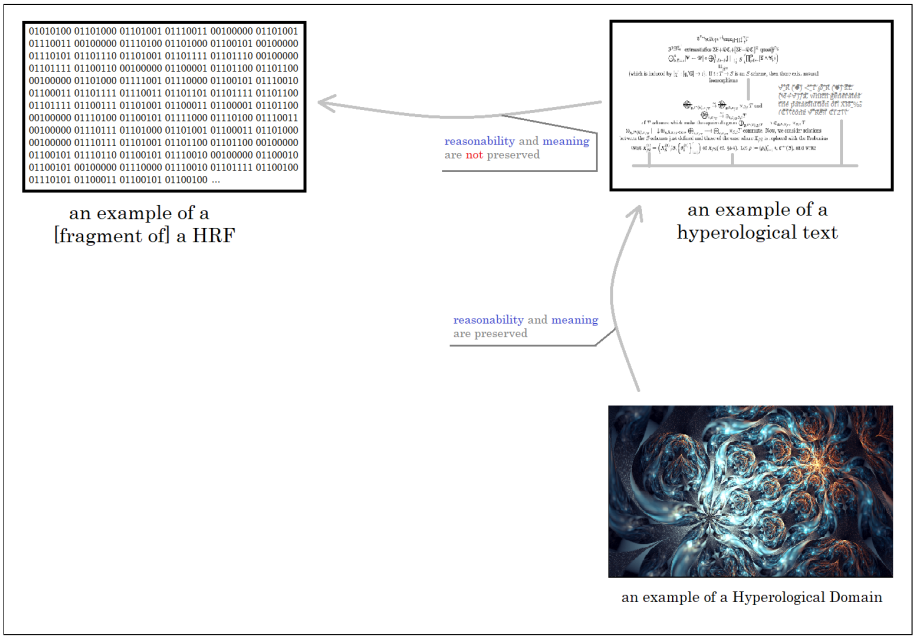

Figure 2: reduction of Hyperological Domains to **HRF**s.

Principles of Generality: Metaphysical

These principles concern necessary metaphysical assumptions for hyperology. [Fig. 3]

GM1. Hyperologists should should assume‡ the existence of the entire hyperological domain of discourse as a completed object which shall be notated as the $\forall^+$-Realm.

(This is not Box Absolutism in disguise, the purpose of **GM1** is not to set a general conceptual restriction on the domain of Hyperology, but to further aid Principles in this list which make the distinction between **MRL** and intended semantics of hyperology more simple and clear)

GM2. Hyperologists should assume‡ that the internal logic and metaphysics of the $\forall^+$-Realm are too complex and nuanced to be even vaguely defined at any point of hyperological practice.

(**GM2** prevents any attempts at general internal theory of the $\forall^+$-Realm from succeeding, forcing hyperologists to approach hyperology as an iterative and endless process of approximation the internal logic of the $\forall^+$-Realm. **GM2** is the meaning behind the prefix "hyper-" in hyperology [and its branches])

GM3. Hyperologists should treat the $\forall^+$-Realm as if it is completely and in all ways isolated from **MRL**.

(GM3 further prevents hyperological mysticism as well as sets the ultimate restriction on the semantics of such hyperological concepts as transfiction or thought-levels)

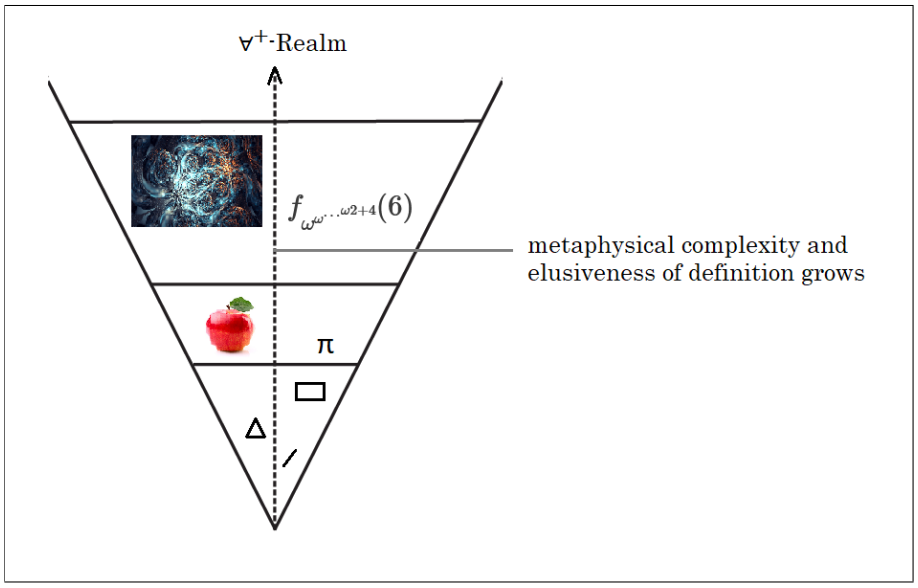

Figure 3: The overall picture of the $\forall^+$-Realm.

Principles of Generality: Logical

These principles concern logical and methodological assumptions for hyperology.

GL1$_1$. Hyperologists should should assume[‡] the existence of the informal framework of reasoning which shall be notated as Commonsense Reasoning [**CR**].

(**CR** acts as the informal analogue of the metatheory for hyperology)

GL1$_2$. **CR** contains no formal axioms or rules of inference and universally valid laws in general. The purpose of **CR** is not universal validity of arguments, but instead iterative clarification of arguments, until universal agreement and understanding of their *structure* and *nature* is achieved.

(structure of the argument: its map of deductive steps;
nature of the argument: its assumptions, background assumptions and inference rules)

GL2. Hyperological Proofs and Arguments should rely on the use of **CR** and **GHP**.

(hyperology is a fundamentally informal practice, which is nonetheless best carried out in a methodical and scientific manner)

Key:

‡ = (or, at least, suspend their disbelief in)

Important Terms:

MRL — Mundane Real Life [p.1]
MA — Mundane Assumptions [p.2]
reasonable reduction [p.3]
meaningful reduction [p.3]
HRF – Hyperologically-Reductive Formalisms [p.3]
$\forall^{+}$-Realm [p.5]
CR — Commonsense Reasoning [p.6]
structure of the argument [p.6]
nature of the argument [p.6]

The true magnitude of Absolute Totality

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Abstract

In this paper we introduce the reader to mental constructions which far surpass anything present in modern analytic philosophy and provide arguments against the well-established consensus that the scope of proper classes adequately reflects the magnitude of absolute Everything. An argument is provided that some of the greater mentally accessible constructions described in the paper are too great (in terms of cardinality and lengths of orderings) to have a formal structural ontology and so are incompatible with metaphysical positions such as ontic structural realism which some philosophers don't view as severely limiting.

1 Defence

To enter the realm of the constructions described in the paper we must first defend its conceptual coherence.

We shall present a nonstandard interpretation of the Burali-Forti paradox.

1.1 The modern perspective

As a consequence of the developments in the foundations of mathematics, set theory is seen as grounding mathematics as a whole. Formalists' conclusion is that all mathematical structures and phenomena can always be treated as sets with relations defined over them. Platonists' conclusion is that the realm of abstract mathematical objects is one-sorted — every abstract mathematical object is ontologically a set. Accordingly, proper-classes are seen as ethereal phenomena which do not bear actual existence as abstract individuals but instead lie at the very limit of the realm of abstract objects as a whole.

A major role in the formation of the view that proper classes as the untranscendible, or at least, not with philosophically fruitful results, was played by Georg Cantor's own views on the subject. Cantor linked the Absolute Infinite with God, and believed it satisfied the full reflection principle: every property of the Absolute Infinite is also held by some smaller object. Cantor's insight is so crucial that it still motivates the biggest subject in set theory — large cardinals. The stronger a large cardinal is the closer properties to full reflection principle it bears.

Burali-Forti paradox is then seen as reaffirming the conclusion that to speak of abstract objects is to speak of sets and that to speak of quantification over absolutely every abstract object (or even absolutely everything if one accepts ontic structural realism) is to quantify over the proper class V. Extending the idea, the consensus is that proper classes and higher-order collections are to be seen as nothing but byproducts of second-order and higher order quantification over V.

1.2 Burali-Forti paradox and its relatives

To present a different perspective on the Burali-Forti paradox we must first deconstruct it. Consider the following family of paradoxes:

FINITE WELL-ORDERINGS

Assume all well-orderings are finite (1)

Consider the well-ordering of all finite well-orderings, notate it as Ω (2)

Then, since all well-orderings are finite, Ω itself is a finite well-ordering and must be a proper initial segment of the well-ordering of all finite well-orderings

It follows that Ω is a proper initial segment of itself

For any finite well-ordering, its successor well-ordering is also finite

It follows that $\Omega + 1 < \Omega$ contradiction.

As a consequence, we are forced to abandon one of the two assumptions:

The assumption that all well-orderings are finite. (1)
The assumption that the well-ordering of all finite well-ordering exists. (2)

Set theorists, mathematicians and most modern analytical philosophers merrily abandon the assumption (1) and accept the realm of transfinite.

TYPES OF WELL-ORDERINGS IN GENERAL

Assume all well-orderings are computable/countable/less than 27th Woodin cardinal

Consider the well-ordering of all ——— well-orderings, notate it as Ω

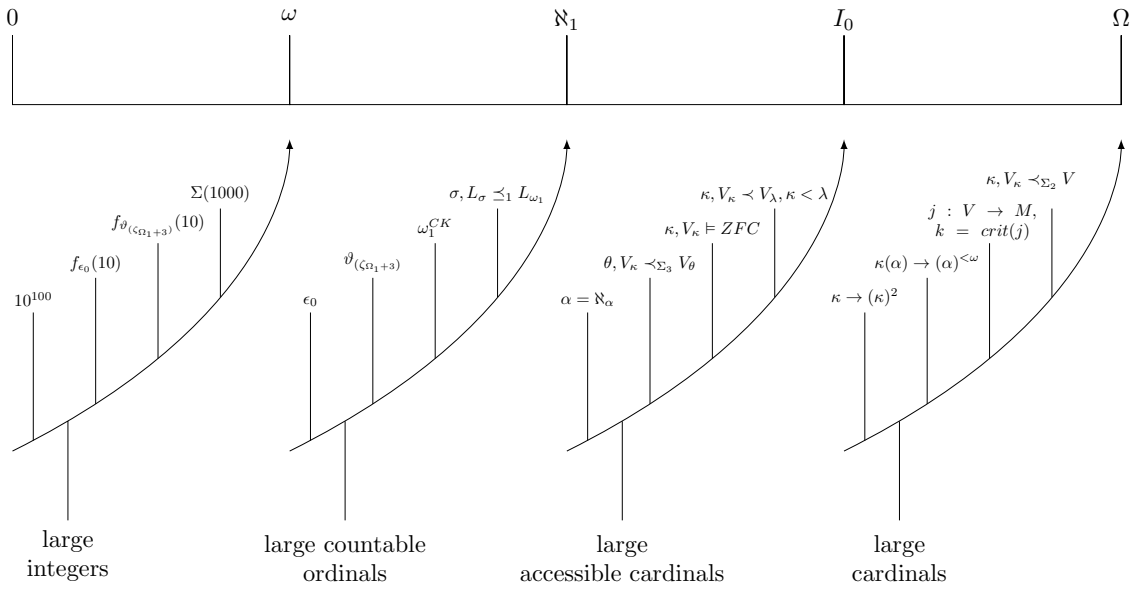
Then, since all well-orderings are ———, Ω itself is a ——— well-ordering and must be a proper initial segment of the well-ordering of all ——— well-orderings.

It follows that Ω is a proper initial segment of itself

For any ——— well-ordering, its successor well-ordering is also ———
It follows that $\Omega + 1 < \Omega$ contradiction.

As seen from this generalized argument the analogues of Burali-Forti paradox have exact same structure as the original paradox, and the analogues are valid as long as the supremum of all existing well-orderings is assumed to be a limit well-ordering. Set theorists have no issue breaking past this limit simply by considering more general kinds of well-orderings then the limit well-ordering admits.

However the original Burali-Forti paradox stands out as a barrier harder to break



Well-orderings can be grouped in several ontologically significant categories.

- Finite ordinals.
- Infinite ordinals. ω introduces the realm of transfinite structures with properties completely unseen in the realm of the finite. Ontological finitists already view infinite ordinals as nothing but a byproduct of mathematical "symbolic games".
- Uncomputable ordinals. Ordinals past ω_1^{CK} introduce intricacies of admissible ordinals unseen in the computable realm. Those who subscribe to metaphysical analogues of Church–Turing–Deutsch principle view uncomputable ordinals similarly.
- Uncountable ordinals. Ordinals past ω_1 introduce previously unseen uncountability and its consequences.
- Large cardinals. Ordinals past the first worldly cardinal introduce the vastly rich world of large cardinals.

However well-orderings past Ω introduce seemingly nothing. There is seemingly nothing special, no conceptual gain from considering $\Omega{+}1$ or $\Omega \cdot 2$ or Ω^+ except the technical and ontological difficulties behind such well-orderings. We are tempted to accept the conclusion that such well-orderings are not really ontologically grounded, are rather problematic while being completely unfruitful. After all, treating every abstract mathematical object ontologically as a set proves to be wildly successful and fruitful.

In fact, proper-class sized well-orderings are so similar to set-sized well-orderings that they are naturally elementarily equivalent to much smaller, large cardinal-sized well-orderings. Reductions of the considered well-orderings virtually never end up exceeding Mahlo cardinals. Those who considered the proper class -sized and greater well-orderings are then invited to study the large cardinal hierarchy, which is really where all of the fruitfulness lies. Suddenly, all hopes of finding something remarkable or ontologically meaningful about well-orderings past Ω are lost.

1.3 Platonists and Formalists

To find ontological meaning and non-triviality of proper class -sized and greater well-orderings we shall consider the following analogy:

Countable models $\mathcal{M}$ of ZFC fail to satisfy external fullness of the powerset of $\mathbb{N}$ which is something Platonists find philosophically unsatisfying about such models. Formalists, on the other hand, aren't

bothered by such models at all as the metatheoretically-definable subsets are the only kinds of subsets truly relevant to the formal study of set theory. As a consequence ω_1, to formalists, is nothing but a useful fiction and they have no need of ontological commitment to any ordinals greater than very large countable ordinals such that for all practical purposes they are indiscernible from uncountable ordinals.

Analogously, irreducibility of Ω to sets is viewed by set-theoretical Platonists as uncountability of ω_1 is seen by formalists - It doesn't bear ontological existence, since $(\Omega, <)$ is viewed by set theoretical Platonists not as an individual object but rather a byproduct of considering the realm of abstract objects in full generality. Set-theoretical Platonists, understandably, picture the realm of all abstract objects as proper-class sized, after all, the idea that every abstract mathematical object is a set is wildly successful. Extending this idea, Platonists picture absolute Everything as proper-class sized as other kinds of objects, beside abstract mathematical don't seem to significantly add up to the total amount. This position is ontologically comfortable for set-theoretical Platonists and is virtually never put to doubt by other philosophers. It is simply unlikely for them to seriously consider large cardinals let alone well-orderings past Ω in the setting of ontology in the first place, and even if they do, at the first glance Burali-Forti paradox seems to be an argument compelling enough against the impossibility of absolute Everything being any greater than Ω.

1.4 The alternative perspective

Ω can and should be appreciated as the supremum of all well-orderings amenable to a single logical sort, in case of Ω the sort involved is "set". Being the supremum, Ω is by an argument, obviously similar to Burali-Forti paradox, not amenable to a single logical sort. We shall notate the property of Ω of not being amenable to single logical sort as "1-sort irreducibility". [accordingly, being amenable to a single logical sort shall be notated as 1-sort reducibility].[‡]

Well-orderings α which are a β-sort irreducible shall be notated as $\alpha_{\dagger\beta}$.
The least well-ordering which is β-sort irreducible shall be notated as $\omega_{\dagger\beta}$.

1-sort irreducibility of $\omega_{\dagger 1}$ should be seen exactly in the same light as uncountability of ω_1. Just the same way the conception of ω_1 doesn't signify that we should stop and reaffirm that all mathematical objects are countable and that ω_1 bears no actual platonic existence, we should instead view the conception of 1-sort irreducibility of $\omega_{\dagger 1}$ as the first step towards something great, much greater in scale then the all of the previously considered conceptions. $\omega_{\dagger 1}$ instantly makes us wonder what kind of beasts $\omega_{\dagger 2}$ and $\omega_{\dagger\Omega}$ are, just like ω_1 makes us instantly wonder what kind of beasts ω_2 and ω_ω are. Usually many-sorted theories of sets and classes seem jumbled and uninspiring, however once we look at Ω from the perspective of 1-sort irreducibility we gain a newfound appreciation for such treatments.

1.5 Scales of α-sort irreducibility

Let us realize the massive scale of the leap from the supremum of all alpha-irreducible well-orders to the supremum of all alpha+1-irreducible well-orders.

α-sort irreducibility, unlike superclass-level isn't exhausted at the "cardinal successor", for lack of a better term, of a collection we started with. A well-ordering too great to be proper class-sized is a mere proper superclass and acts in about every way as "the next initial ordinal past Ω", while well-orderings too great to be 2-sort reducible are much *much* greater.

1.6 Standard models of a special type of Ω-sized theories

Consider a one-sorted theory $\mathfrak{T}$ with Ω-many constants c_α for each ordinal α and Ω-many axioms stating that the constants are pairwise non-equal. Let c_Ω be an additional constant stated to be pairwise non-equal to all c_α for ordinal α via Ω additional axioms. Assume ZFC_2 is a fragment of $\mathfrak{T}$. Let $\phi(x)$ be the predicate of being an initial ordinal. Let $\mathfrak{T}$ contain axioms of the form $\phi(c)$, for each

[‡]Further in the paper we shall present an argument why well-orderings of the form $\omega_{\dagger\beta}$ should be seen as β-th instances of the "full" reflection principle envisioned by Georg Cantor.

constant of the theory. Finally, let $\mathfrak{T}$ contain axioms of the form $\psi(c_\alpha, c_\Omega)$, for each ordinal α, where $\psi(\beta, \gamma)$ is a predicate "β is a lesser ordinal then γ".

Since $\mathfrak{T}$ is one-sorted it is sort-nonstandard, meaning all of its models are externally greater than than 1-sort reducible by size. If $\mathfrak{T}$ is viewed as object theory, it is externally, in other words, meta-theoretically unsound with respect to the amount of sorts in its models. If $\mathfrak{T}$ is viewed as metatheory, it is externally, in other words, meta-meta-theoretically unsound accordingly.

At cost of being sort-nonstandard, $\mathfrak{T}$ is able to axiomatize 1-sort irreducible collections greater in cardinality than Ω **concretely**, meaning without the circularity of using greater than Ω-many axioms or constants. There is no necessity to stop at $\mathfrak{T}$, one could easily construct theories with 2 cardinals above Ω, ω cardinals above Ω, a 53-huge cardinal above Ω, etc., modulo trivial adjustments to the construction of $\mathfrak{T}$.

However, the supremum of the size of least models of concrete theories is a clear limit. Let $\omega_{\dagger 1}^{\mathfrak{M}}$ be the notation of the supremum. It is notable that $\text{cof}(\omega_{\dagger 1}^{\mathfrak{M}}) = \Omega^+$. One could extend the construction to one-sorted theories which are not concrete or construct hierarchies of "concreteness degrees" akin to the hierarchy of admissible ordinals.

Such hierarchies get increasingly rich and layered, and thus reflection properties should eventually emerge. Initial segments α which satisfy such properties are the concreteness degree analogues of large cardinals and the limit of α which admit such reflection principles should be analogous to Ω. The property which grounds full reflection at Ω is its set-irreducibility, and analogously, the property which grounds full reflection at the limit is 2-sort irreducibility.

1.7 Nested limit-Universe construction

Consider a two-sorted theory of sets, one for "small" sets and one for "large" sets. Small sets are elements of $V_{<\kappa}$, κ being an instance of an inaccessible cardinal, and all sets are "large".

If axioms of ZFC hold for large sets and κ is the least inaccessible cardinal we get the simplest case of a doubly nested Grothendieck-Zermelo universe. Instead, we may have considered κ to be closed under taking the Mahlo operation or taking the next weakly compact, or the next 53-huge, or some larger cardinal each time building an increasingly larger initial Grothendieck-Zermelo universe, however, without any additional boost on how much further the top-layer Grothendieck-Zermelo universe extends. To extend the nested universe on both ends should have considered that the layer of large sets is also closed under taking Mahlo operation, weakly compact, 53-huge, etc., as long existence of proper-class amount of such cardinals is consistent. Extending our theory of a 2-nested Grothendieck-Zermelo universe on both layers with large cardinals we get increasingly rich structure.

Completing the idea, we may, philosophically, consider the limit of such extensions.* We would get a 2-nested Grothendieck-Zermelo universe whose bottom layer is already Ω-tall and whose outer layer extends to something much greater than mere next inaccessible, Mahlo or the next 53-huge. The height of the second layer would be $\omega_{\dagger 1}$ — the analogue of Ω for 1-sort irreducible collections. It would be the supremum of all 2-sort reducible and, as a consequence, be the least 2-sort irreducible well-ordering.

If we considered the analogue of the limit-extension of a 3-nested Grothendieck-Zermelo universe we would get $\omega_{\dagger 2}$ — the analogue of Ω for 2-sort reducible collections as the height of the overall intended interpretation.

We may then consider the similar limit extension for w-nested Grothendieck-Zermelo universes, I_0-nested Grothendieck-Zermelo universe and Ω-nested Grothendieck-Zermelo universes. We may also consider more intricate structures such as limit extensions of Ω+1-nested Grothendieck-Zermelo universes or limit-extensions of κ-nested Grothendieck-Zermelo universes, where κ is the least 2-sort irreducible well-ordering. If we wish the height of the intended interpretation to be the "12th extendible cardinal past the supremum of 2-sort reducible well-orders" we could cook up the appropriate limit-extension construction. In this particular example case we would start with a 3-sorted theory of a 3-nested Grothendieck-Zermelo universe. Postulate the full reflection of the small and moderate universes and postulate the existence of sets up to the next 12-extendible on the top layer.

*Mere closure under large cardinals is far, far from enough due to concreteness degrees, yet it is still possible to mentally address such proper completion in the same manner Platonists mentally address Th($\mathbb{N}$) or (Ω, $<$).

In fact, there is no need to stop at α-sort irreducibility for finite α. We can conceptualize and appreciate the colossal well-orders which are ω-sort irreducible, Ω-sort irreducible, $\varsigma = \varsigma_{\dagger\varsigma}$ etc.

1.8 Relation between $\mathcal{P}(\alpha)$ and the α-sort successor operation

It may seem straightforward that the collection of all α-sort irreducible well-orderings is closed under the powercollection operation, for each well-ordering α, however, without explicitly assuming this principle as an axiom it is consistent that it is not the case. Under the perspective of α-sort irreducibility the axiom of powerset in ZFC, states that powerset operation preserves 1-reducibility, we shall propose a similar, more general axiom.

Global Powercollection †-Idempotence. For all well-orderings α,

$$\dagger(\mathcal{P}(\alpha)) = \dagger(\alpha)$$

Without the presence of **GPI**, well-orderings α such that $\dagger(\mathcal{P}(\alpha)) = \dagger(\alpha)$ shall be notated as †-idempotent.

A slightly weaker axiom shall also be considered.

Moderate Powercollection †-Idempotence. For all well-orderings α, β

$$(\dagger(\mathcal{P}(\alpha)) = \dagger(\alpha)) \longrightarrow ((\dagger(\beta) = \dagger(\alpha)) \longleftrightarrow (\dagger(\mathcal{P}(\beta)) = \dagger(\alpha))$$

While **GPI** might be false any set theoretical platonist would agree that **MPI** holds at least in some structures.

Axioms such as **GPI** and **MPI** may or may not hold in initial segments of the hierarchy of all α-sort irreducible well-orderings ordered under order-preserving embeddings. **GPI** certainly holds in V and its violation in $\omega_{\dagger 1}$ would contradict the principle of *minimal cumulative structural violation.*

Under the same reasoning, it should be the case that $\omega_{\dagger 2}$, $\omega_{\dagger 3}$, etc. $\models$ **GPI**. On the other hand violation of **GPI** is less structurally severe than violation of well-orderability so the least well-ordering α such that $\alpha \not\models$ **GPI** must exist and should in some way contradict the premises of the proof above. This observation hints towards the hierarchy of instances of violations of **GPI** and principles similar to it. Perhaps some kinds of such instances play the role of "large cardinal" properties in the realm of α-sort irreducble well-orderings.

1.9 Large Cardinals beyond Ω

The notion of α-sort irreducibility provides us with a completely new perspective on the well-orderings past Ω and allows us to create a hierarchy of increasing scope and complexity akin to the hierarchy of large cardinals or large countable ordinals.

Definition 1.1 (α-sort fixed point)**.** κ is α-sort-inaccessible iff κ is a κ-sort irreducible

Definition 1.2 (α-sort inaccessible)**.** κ is α-sort-inaccessible iff κ is a κ-sort irreducible and $cof(\kappa) = \kappa$

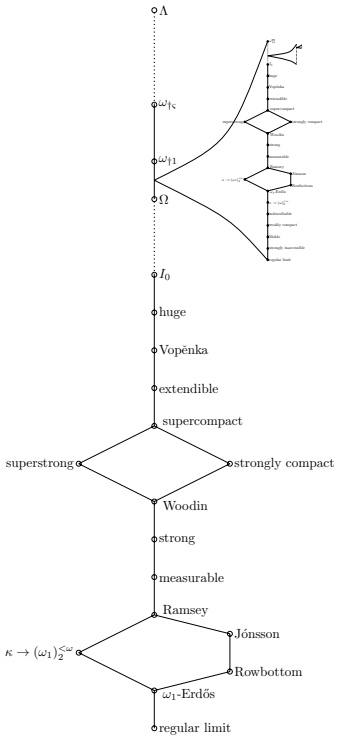
Definition 1.3 (α-sort Mahlo)**.** κ is α-sort Mahlo iff κ is κ-sort irreducible, $cof(\kappa) = \kappa$ any normal function f : $\kappa \to \kappa$ has a α-sort inaccessible fixed point.

Most variations of fixed points, inaccessibles and Mahlo cardinals translate straightforwardly into α-sort irreducible analogues.

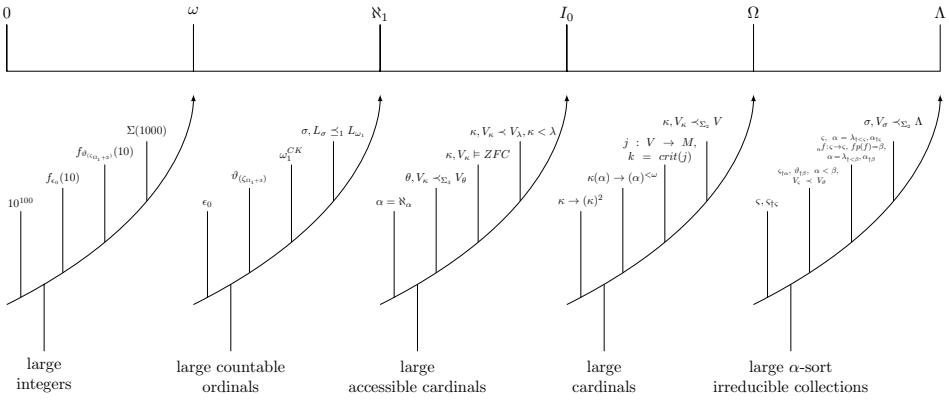
1.10 Nested Large Cardinal hierarchies

Hierarchies of increasingly reflective initial segments of the hierarchy of all well-orderings become increasingly deeply nested in rapid succession. Figuratively speaking, the hierarchy of concreteness degrees relates to the hierarchy of large α-sort irreducible well-orderings the same way the hierarchy of recursively large ordinals relates to the hierarchy of large cardinals.

$$\text{rec. large } \kappa \xmapsto{\omega_1 \mapsto \Omega} \text{large } \kappa \;\cong\; \omega^{\mathfrak{M}}_{\dagger\alpha} \xmapsto{\omega_{\dagger 1} \mapsto \Lambda} \text{large } \omega_{\dagger\alpha}$$



Recognizing ω_1 as "recursively Ord" and $\omega_{\dagger 1}$ as "concretely Λ" we can now fully envision the mathematical non-trivially in well-orderings past Ω. It is now particularly clear that, while Ω contains only a single copy of the large cardinal hierarchy, most well-orderings past Ω contain colossal amounts of similar such hierarchies simultaneously. As a consequence, one may study their ordering, consider special kinds of well-orderings which form initial segments of particular hierarchies or create and study more intricate notions related to the hierarchies. It is unclear how deeply nested the hierarchies can get and establishing the approximate limit is a also possible direction for future research.



2 Going much further

2.1 Deconstructing the concept of well-orderings

Having made a huge leap into the realm of α-sort irreducible collections we may still go forward and make a colossal leap.

What if we consider the limit of all these α-sort irreducible well-orderings? The limit, in Burali-Forti fashion, would be something which is the supremum of the kind of well-orderings we are considering.

It might be not initially clear that α-sort irreducibility was our last resort for extending the concept of well-ordering past Ω. However it will be clear if we call to mind the definition of a well-order as a concept.

A well-order is precisely a well-founded linear order.

Note that the cardinality or size issues of the well-ordering do not cause contradictions as long as the sizes are well-orderable. For this reason a well-ordering of an amorphous set is inherently contradictory but well-ordering of a proper class or a greater collection is not.

Now, note that the concept of well-order κ which is α-sort irreducible is never inherently contradictory as long as κ and α are both well-orderable. If α is limit well-ordering then it is naturally cofinal in κ, otherwise it is embeddable as a well-order in κ (consider the initial well-orders which are $<\alpha$-sort irreducible, these initial segments of κ would be elements of the well-ordering of α under the same well-ordering inherited from κ). For this reason, once we run out of α-sort irreducible well-orderings we run out of well-orderings in general, regardless of their size.

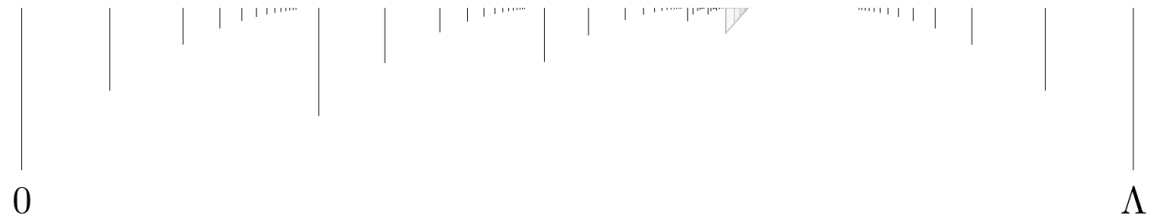
The only way to extend the hierarchy is to cast aside some of the essential non size-related properties of well-orderings. To compromise linearity of the ordering is clearly too drastic of a difference, our hierarchy was in many ways about length, so it is vital to the hierarchy. To compromise classical logic for paraconsistent is more reasonable but still is too hasty. We should compromise well-orderability minimally. Clearly, reconsidering the whole background logic may not be the most minimal compromise yet.

We shall turn our attention to well-foundedness, we shall consider a particular family properties which violate it. The properties form a very natural hierarchy by severity of the violation.[‡]

2.2 ω-almost-wellorderings

Define an order to be ω-almost-wellordered iff it is linear and contains no strictly decreasing chains of length ω^2, the motivation for such a definition will be clear further down the text.

In fact, for things to remain consistent and relatively similar to previous endeavours we need to drop another important property of well-orders. Supremum can no can longer always be the union of previous orders, as existence of such unions in some special cases is inconsistent. To work around that we declare the union to be slightly longer, in a precise sense, and restrict ourselves from taking the initial segment at exactly the union as a valid sub-collection.



Definition 2.1 (Λ)**.** Λ is the supremum of all well-orderings regardless of their collection types.

Λ, has no well-ordered initial segment that is equal to exactly the union of all well-orderings. Λ also contains "technical elements" at the end of it ordered as reverse ω. This is to cause slight ill-foundedness to avoid Burali-Forti paradox. A notable property of Λ is that any its initial segment is either isomorphic to itself or is well-ordered. Note that any decreasing sequence in Λ is not longer than $\omega + n$, for some finite ordinal n, so Λ is ω-almost-wellordered We can perform usual ordinal operations on Λ while retaining the essential properties of ordinal arithmetic as well as retaining ω-almost-wellorderability. Ordinal successor needs to be slightly redefined.

Definition 2.2 (The 3 fundamental types of ω-almost-wellorderings)**.**

1. Successor: λ which satisfy $\alpha + 1 = \lambda$ for some ω-almost-wellordering α.
2. Limit: λ such that $\forall \alpha < \lambda$, $\exists \beta$ such that $\alpha < \beta < \lambda$, α, β are ω-almost-wellorderings.
3. ω^*-point (special case of limit): λ such that $\exists$ technical b $\in \lambda$ not bounded by any non-technical a $\in \lambda$.

Definition 2.3 (Ordinal successor of an ω-almost-wellordering)**.** Ordinal successor of λ is the shortest (up to isomorphism) ω-almost-wellordered order extending λ not order isomorphic to λ.

[‡]In a precise sense, the property of self-containment is the supremum of the hierarchy.

Remark. *The definition prevents reverse-ω-points from being their own successors and prevents their successors from being limit.*

Definition 2.4 (Ordinal sum $\alpha + \beta$ of ω-almost-wellorderings and well-orderings)**.** Ordinal sum for non-ω^*-point α and arbitrary β is the lexicographic union $\alpha \cup \beta$; for ω^*-point α and arbitrary β is the lexicographic union $\alpha \cup \omega \cup \beta$.

Remark. *This definition prevent an analogous pathology.*

Definition 2.5 (Ordinal product $\alpha \cdot \beta$ of ω-almost-wellorderings and well-orderings)**.** Ordinal product of α and β is the lexicographic product $\alpha \times \beta$.

Definition 2.6 (Ordinal exponentiation α^β of ω-almost-wellorderings and well-orderings)**.** Ordinal exponentiation of α and β is the lexicographic order on the Cartesian power α^β.

Definition 2.7 (Principle of preservation of technical elements)**.** Technical elements are defined to be idempotent under left multiplication and left exponentiation for all ω-almost-wellorderings $\geq \Lambda$.

Remark. *This is to prevent pathological behavior of the operations at technical elements and make the hierarchy of ω-almost-wellorderings a more direct generalization of the hierarchy of ordinals.*

Theorem 1. *Λ+1 and Λ+α, where α is any well-order is ω-almost-wellordered; $\Lambda \cdot 2$ is ω-almost-wellordered.*

Proof. Throughout the orders at most 2 copies of ω^* are present, the rest of the order is well-ordered, meaning maximally long decreasing chains are of length $\omega \cdot 2 + n$, for finite ordinals n. □

Theorem 2. *$\Lambda \cdot \alpha$, where α is any well-order is ω-almost-wellordered.*

Proof. Throughout the order the copies of ω^* are ordered as α, which implies that, in the decreasing chains of the resulting order, elements of only finitely many copies of ω^* can be present [otherwise well-orderability of the order of copies of ω^* would be contradicted]. □

Theorem 3. *$\Lambda \cdot \lambda$ is an ω^*-point iff λ is any successor or ω^*-point.*

Proof. If λ is a successor then $\Lambda \cdot \lambda$ ends in a copy of λ which ends with technical elements ordered as reverse ω, If λ is an ω^*-point then $\Lambda \cdot \lambda$ by preservation of technical elements $\Lambda \cdot \lambda$ ends with technical elements ordered as reverse ω. If λ is limit then the resulting order contains neither the last copy of Λ nor preserved technical elements and hence, is a non ω^*-point limit. □

Theorem 4. *Λ^α, under ordinal exponentiation, where α is an arbitrarily well-order is ω-almost-wellordered.*

Proof. Analogous. □

Theorem 5. *Λ^λ, under ordinal exponentiation, is a reverse-ω-point iff λ is any successor or ω^*-point.*

Proof. Iff λ is successor Λ^λ is equal to $\Lambda^\alpha \cdot \Lambda$ for some α, and by preservation of technical elements the order ends with technical elements ordered as ω^*. Iff λ is an ω^*-point then by preservation of technical elements Λ^λ ends with technical elements ordered as ω^*. Iff λ is a non-ω^*-point limit then Λ^λ is the union $\Lambda^{\alpha<\lambda}$ which contains no greatest power of Λ and hence neither contains a greatest element nor ends with technical elements ordered as ω^*.

□

Definition of cardinal successor needs to be slightly adjusted as well.

Definition 2.8 (Cardinal successor of ω-almost-wellordering)**.** Cardinal successor of κ where κ is an ω-almost-wellordering is the least ω-almost-wellordering λ (up to isomorphism) such that there is no injection f : $\lambda \to \kappa$.

With this definition nothing prevents us from iterating cardinal successor over ω-almost-wellorderings.

Cofinality of ω-almost-wellorderings is especially well-behaved. If we exclude the impact of "technical elements" on lengths of cofinal sub-orders, cofinalities would behave exactly as expected.

Definition 2.9 (Cofinality of ω-almost-wellorderings)**.** $cof(\lambda)$ for ω-almost-wellorderings λ is defined as the least cardinality of sub-collections A $\subset \lambda$ such that there is no non-technical elements b $\in \lambda$ greater than all non-technical elements a $\in$ A

Theorem 6. *Cofinality of cardinal successor of Λ (Λ^+ for short) is Λ^+.*

Proof. Consider cof(Λ^+) $< \Lambda^+$, then Λ^+ is at most a union of Λ-many initial segments, taken at elements of the cofinal sequence, each sized at most Λ. This establishes a bijection between Λ^+ and at most $\Lambda \cdot 2$, however $\Lambda \cdot 2$ is equinumerous to Λ, contradiction. □

Theorem 7. *If κ is a cardinal successor of an ω-almost-wellordering λ then cof(κ) = κ.*

Proof. Analogous. □

[We immediately infer that if cof(κ) $< \kappa$, then κ is not a successor of any λ, in other words, the familiar property of successor and singular cardinals is preserved]

We may consider inaccessible ω-almost-wellorderings, Mahlo ω-almost-wellorderings, etc. Nothing prevents us from iterating even the "α-sort successor" operation on ω-almost-wellorderings. It behaves exactly the same way it does on well-orders. It doesn't interfere with any of the structural properties of orders involved as all it does is introduce an ontological shift to a higher type of collections, each iteration of α-sort successor acts as jump to a much muc much larger regular limit ω-almost-wellordering. Going through Λ, $\omega_{\dagger\Lambda+1}$, $\omega_{\dagger\Lambda+2}$, $\omega_{\dagger\Lambda^+}$, etc... We eventually get stuck once again and reach a special Burali-Forti limit.

Definition 2.10 (($\omega^* \cdot 2$)-limit)**.** An ω-almost-wellordering λ is ($\omega^* \cdot 2$)-limit iff λ contains an end segment of technical elements of order type $\omega^* \cdot 2$.

Although, it is consistent to assume that no ω-almost-wellordering λ is ($\omega^* \cdot 2$)-limit, such property of λ is less structurally violating than violation of ω-almost-wellorderability, so, due to the principle of *minimal cumulative structural violation* it is better to assume the existence of ω-almost-wellordered ($\omega^* \cdot 2$)-limits.

Remark. *Analogously defined ω-almost-wellordered $(\omega^* \cdot n)$-limits, for all finite ordinals n also exist under similar reasoning.*

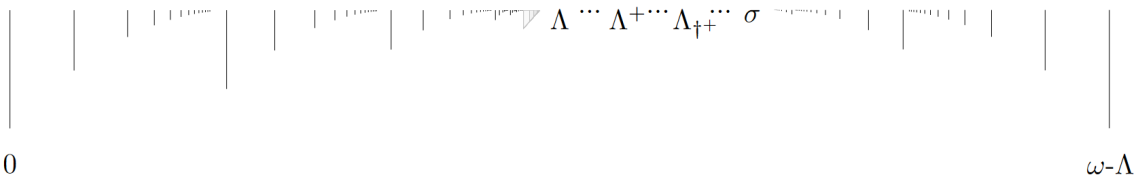
It is notable that the supremum of least $(\omega^* \cdot n)$-limits, for finite ordinals n, need not fail to be ω-almost-wellorderable. In fact, the supremum may not even be an ω^*-point, and, under axioms which cohere with the principle of *minimal cumulative structural violation*, it shouldn't be. It is also possible to consider $(\omega^* \cdot n)$-limits with large cardinal or reflective properties which, under the same principle, should be much larger than their non-$(\omega^* \cdot n)$-limit counterparts.

Finally, once more, we have to drop a structural property of the orders involved in our hierarchy. Dropping liearity of orders or consistency of the background logic once again proves to be too drastic of a change and we instead let go of well-orderability just slightly more drastically than before. We let go of ω-almost-wellorderability, and instead require our orders to be just ω^2-almost-wellordered.

2.3 ω^2-almost-wellorderings

Define an order to be ω^2-almost-wellordered iff it is linear and contains no strictly decreasing chains of length ω^3

Motivation for such a definition is now more clear. The hierarchy continues smoothly and is essentially the same as before



Definition 2.11 (Λ)**.** ω-Λ is the supremum of all ω-almost-wellorderings regardless of their collection types.

In similar spirit to Λ, ω-Λ has no ω-almost-wellordered initial segment that is equal to exactly the union of all ω-almost-wellorderings. Technical elements at the end of ω-Λ are ordered as reverse ω^2, the next additively indecomposable ordinal after ω. This greater degree of ill-foundedness allows one to minimally violate ω-almost-wellorederability and solve the relevant version of Burali-Forti paradox. ω-Λ, in many ways, is similar to Λ and plays a similar role. ω-Λ marks the point, past which counting numbers contain two different types of reverse limit points, reverse-ω-points and reverse-ω^2-points, the latter occurring much more sparsely.

Definition 2.12 (the 2 fundamental types of reverse limit points of ω^2-almost-wellorderings)**.**

1. ω^*-point: λ such that $\exists$ technical b $\in \lambda$ not bounded by any non-technical a $\in \lambda$ and the order type of technical elements c $\geq$ b is $\geq \omega$
2. ω^{2^*}-point: λ such that $\exists$ technical b $\in \lambda$ not bounded by any non-technical a $\in \lambda$ and the order type of technical elements c $\geq$ b is $\geq \omega^2$

Definitions of ordinal successor, sum, product and exponentiation, cardinal successor, cofinality and the principle of preservation of technical elements for ω^2-almost-wellorderings are exactly analogous to the according definitions for ω-almost-wellorderings modulo trivial adjustments.

Analogously to $(\omega^* \cdot n)$-limits, $(\omega^{2^*} \cdot n)$-limits, for each finite ordinal n, should exist within the hierarchy of ω^2-almost-wellorderings ordered under order-preserving embeddings.

Instead of ascending one step higher and defining ω^3-almost-wellorderings and ω^2-Λ we shall conceptually zoom out and consider general α-almost-wellorderings for well-orderings, and λ-almost-wellorderings α.

2.4 General λ-almost-wellorderings

The general pattern of the hierarchy of λ-almost-wellorderings is somewhat straightforward for λ which are limit well-orderings, howver for α-almost-wellordered λ, $\alpha \geq \omega$ the hierarchy is highly nontrivial. One may consider "large cardinal" variants of such orderings.

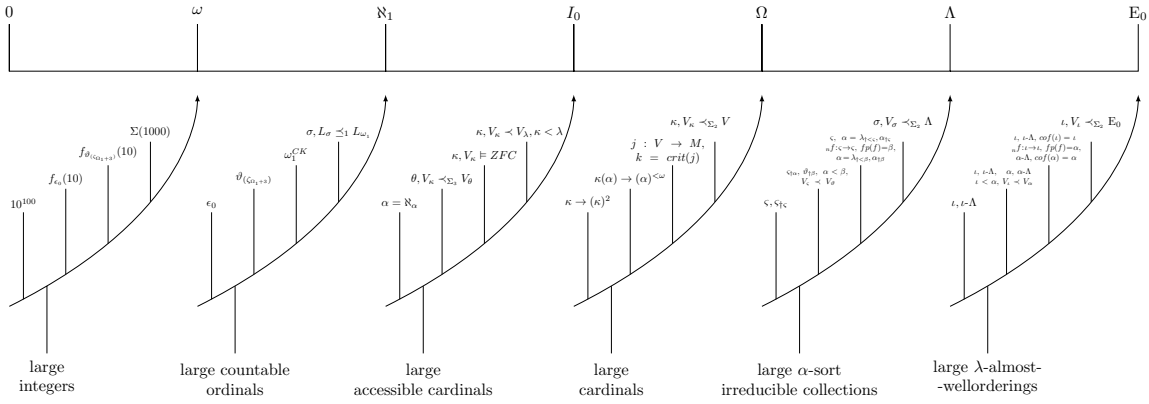
Definition 2.13 (λ-almost-fixed point)**.** λ is λ-almost-fixed point iff λ is a fixed point of the function $\alpha \mapsto \alpha$-Λ

Definition 2.14 (λ-almost-hyperfixed point)**.** λ is λ-almost-fixed point iff λ is a fixed point of the function $\alpha \mapsto \alpha$-th fp of $(\alpha \mapsto \alpha\text{-}\Lambda)$

Definition 2.15 (λ-almost-inaccessible)**.** κ is λ-almost-inaccessible iff κ is a κ-almost-wellordering and $cof(\kappa) = \kappa$

Definition 2.16 (λ-almost-Mahlo)**.** κ is λ-almost-Mahlo iff κ is a κ-almost-wellordering, $cof(\kappa) = \kappa$ any normal function f : $\kappa \to \kappa$ has a λ-almost-inaccessible fixed point.

It is clear that the intermediate hierarchies of reflective properties such as admissibility degrees, large cardinal hierarchies, concreteness degrees and higher are layered to truly colossal degrees at the level of λ-almost-large cardinals. Due to this reason, it is nearly impossible to visualize the layers to appropriate level of detail. The fine structure of the layering is a possible direction for future research.



Definition 2.17 (E_0)**.** E_0 is the supremum of all hereditarily $\leq\kappa$-almost-well-orderings. Equivalently, E_0 is the least ∞-almost counting number or the least counting number ξ such that $\xi \in \xi$.

It is possible to continue the hierarchy of λ-almost-wellorderings past E_0, however, to truly visualize the scope of all counting numbers, it is necessary to take the bird's-eye view and consider much stronger and much more general notions and extensions.

3 The notion of Burali-Forti solutions

Burali-Forti solution is a technical semi-formal term which embodies the global approach to generalizing ordinals to greater counting numbers as shown in the paper.

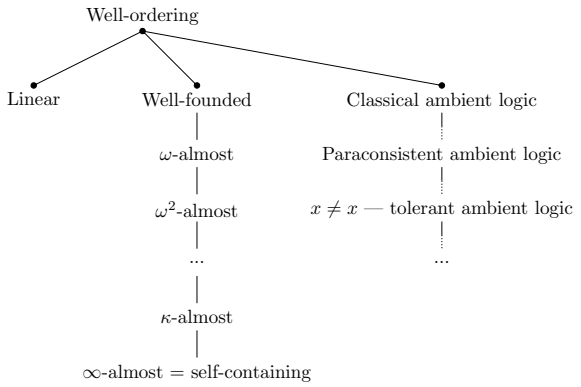
Definition 3.1 (Counting number)**.** Counting number is a term which refers to generalizations of ordinals to greater linear orders such that shorter initial segments of the number line have logically stronger structural properties.

Definition 3.2 (BFS)**.** Abbreviation BFS stands for Burali-Forti solution. BFS is a system of limit counting numbers which are suprema of structurally equally well-behaved counting numbers with respect to a particular structural feature (e.g., cardinality, admissibility degree, concreteness degree).

Definition 3.3 (BFL)**.** Abbreviation BFS stands for Burali-Forti limit. BFL is counting number which is the supremum of a particular collection of BFS.

Definition 3.4 (Good system of BFS)**.** A good system G is an α-sized collection of BFS indexed by β, $|\beta| = \alpha$ such that BFS_γ is less structurally violating than BFS_δ iff $\gamma < \delta$, and for any two sub-collections G_A, G_B of the collection G, $\mathrm{G}_A \not\Longleftrightarrow \mathrm{G}_B$ modulo ambient logic of G.

Definition 3.5 (Supremum of a good system)**.** $sup(G) = \alpha$ iff α is the least counting number such that $\mathrm{BFS}_\beta(\alpha)$ for all $\mathrm{BFS}_\beta \in \mathrm{G}$



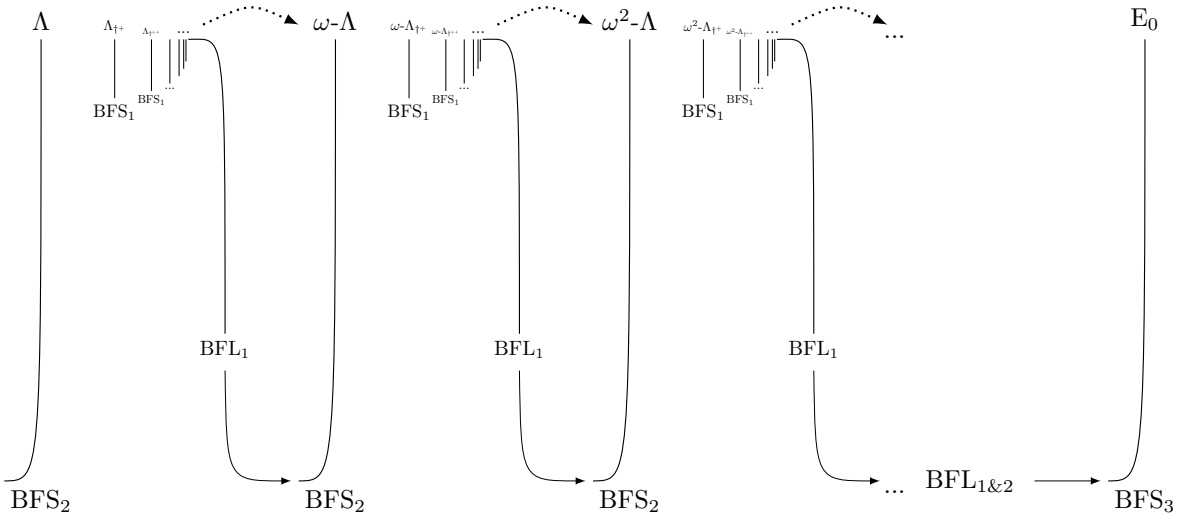
The concept of a well-ordering can be seen as a poset of its characterizing properties ordered by structural freedom with the greatest element being the property of being well-ordered. A sub-order of the poset is shown in the diagram.‡

If the concept of well-ordering is seen through the lens of being a special case of the concept of counting numbers, the property of linearity is a minimal element as linearity of the number line is indispensable from the conception of counting.

The purpose of good systems is to linearize sub-orders of the poset. Linearity provides the basis of the progression of the counting number line in which increase in magnitudes correlates with the increase in structural freedom. Good systems which linearize the poset completely shall be notated as **great systems**.

Notably, ambient logics in which the concept is considered can also be seen as a characterizing property. It is easy to present philosophical arguments that in proper linearizations of the poset these properties appear relatively deep as counting numbers which are greater than themselves or are not self-identical are highly structurally free.

‡The poset is need not form a set



As shown in the diagram, α-sort irreducibility, λ-almost-wellorderability and ∞-almost-wellorderability form a good system of cardinality 3.

Truly colossal counting numbers emerge if we consider those which satisfy reflective or large cardinal properties in the terminology of BFS and good systems. Such counting numbers celebrate their leadership over all counting numbers described so in the previous passages, even those which are too large not to satisfy bizarre properties such as being amenable exclusively to $\kappa_{\dagger^+}$-valued paraconsistent ambient logics or even satisfying $x \neq x$.

3.1 Formalism-inaccessibility

Definition 3.6 (The least Formalism-inaccessible number)**.** F_0 is the least counting number ξ such that for any good system $|G| < \xi$, $sup(G) < \xi$.

Definition 3.7 (α-th Formalism-inaccessible number)**.** F_α, for counting numbers α is α-th counting number ξ such that for any good system $|G| < \xi$, $sup(G) < \xi$.

Formalism-2-inaccessible numbers are precisely the Formalism-inaccessible limits of Formalism-inaccessibles.

Definition 3.8 (α-th Formalism-Mahlo number)**.** F_α, for counting numbers α is α-th counting number ξ such that ξ is Formalism-inaccessible and any normal function $\mathrm{f} : \xi \to \xi$ has a Formalism-inaccessible fixed point.

Nothing prevents the translation of some greater large cardinal and reflective properties into properties of good systems, as well as translation of properties between Mahloness and inaccessibility and below, however, such high-level constructions approach an important limit.

Having considered reflective properties of good systems we are finally forced to let go of any remnants of the assumption that all counting numbers are amenable to formal ontology. While formal ontology of numbers such as "the least Formalism-2-Mahlo" exists but is completely inaccessible to formal investigation, greater orders can no longer can be given neither purely formal structural ontology nor can be essentially formal-structural in any significant way by a direct consequence of their colossal size. We are finally forced into the realm of unformalizable subtleties and ethereal aspects of metaphysics.

4 The least completely unformalizable counting number

Definition 4.1. $\mathscr{K}$ is the supremum of a **great system**,

equivalently, $\mathscr{K}$ is the least unformalizable counting number.

This counting number marks the end of formal structural approach to counting numbers, since all formal structures are of cardinality $< \mathscr{K}$. $\mathscr{K}$ has deep philosophical and, in particular, metaphysical implications. Any domain of discourse, which $\mathscr{K}$ is an element of must be strictly informal logical in nature, or in other words, **unformalizable**. Unformalizability is to be contrasted with insufficient rigorization, existence of obstacles for sufficient rigorization or impossibility of recursively enumerable axiomatization. A concept is **unforamlizable** if it cannot be rigorized even in principle.

$\mathscr{K}$ plays the role of a concrete example of an abstract object so vast that it is cannot be analyzed via formal methods, yet still can be the target of a mental state and analyzed via methods of informal logic. This number marks a hierarchy of counting numbers much more vast then the mere hierarchy of formalizable counting numbers. Nothing prevents us from forming mental states whose targets are $\mathscr{K} + 1$, $\mathscr{K} \cdot 2$, $\mathscr{K}_{\dagger^+}$ and so on, except now, we are not limited by formalizable operations.

Because of the concievability of such extensions,

even $\mathscr{K}$ is unimaginably smaller than the magnitude of absolute totality.

5 The magnitude of Absolute Totality

Definition 5.1. $\mathscr{A}$ is the supremum of *absolutely* all counting numbers,

equivalently, $\mathscr{A}$ is the *absolutely* greatest counting number

Immediately from the definition, it is inferred that $\mathscr{A}$ is greater than all counting numbers greater than it, so $\mathscr{A}$ is closed under the direct conception of greater counting numbers. It is extraordinarily difficult to defend the position that there are ways in which greater counting numbers are conceivable, however such position exists and shall be referred to as "trans-absolutism".

Being a trans-absolutist is equivalent to defending the position that it is possible to conceive of agents which hold greater powers than even the absolutist interpretation of Omnipotence.

Informal Introduction into Basic Hyperology 1 v1.1.3

Goodels

July 2023

1 Abstract

Hyperology is a very new, quickly developing, entirely unique field of philosophy that aims to provide radically new ways of looking at certain philosophical problems. The purpose of Hyperology is to extend our ontology, what we can talk about, what is possible to reason about, and the fundamental limits of what is usually considered, to as far out as possible, while still doing so in a hopefully reasonable and intuitive way. The goal of doing this is to uncover a far broader, more powerful philosophical system which may further human knowledge in new and insightful ways. Hyperology is founded on specific, defined, objective ways of doing things, which will be detailed in later sections.

Hyperology essentially asks the question "are we currently going about metaphysical questions in a limited and oversimplified manner?", and then tries to generalise our methodology in terms of ontological scope and fundamental complexity to an extent far more radical than usually considered.
Hopefully in future, new and interesting applications of the framework of Hyperology will be found, there is exciting potential applications, perhaps there are many cases in many different fields in which Hyperology can unveil hidden complexity not yet observed.
However, the current state of Hyperology is underdeveloped and highly unexplored, due to obscurity of it. At the time of writing, it has only been around in its current form for a few months. There are currently only around under 5 individuals actively developing Hyperology, the purpose of this paper is to present new people to it in a hope of a community interested in seriously developing and expanding upon the field.

2 Introduction

This will serve as a somewhat informal introduction into the basic concepts of Hyperology. This is not meant to be a serious rigorous paper into Hyperology,

but a means to introduce more people into the field. There are some simplifications which have slight technical inaccuracies, but these are mainly trivial and such simplifications are important in order to efficiently teach Hyperology. This paper focuses on providing a more intuitive and informal understanding. It is highly important to read this paper all the way through, as many things said in earlier sections are greatly expanded on and justified in later sections.

3 Ontological Assumptions

There are certain ontological assumptions that we must at least suspend disbelief to assume when engaging within Hyperology. These do not have to be believed, but rather assumed for the purpose of Hyperology. Some of these assumptions may be heavily controversial and seem unreasonable, however, we will see later on within the paper that they are justified and important for certain things we will need to talk about within Hyperology. Regardless of the readers beliefs, within later parts of this paper we will see that at least assuming these ontological statements is vital to be able to talk about certain things in Hyperology.

Firstly, we must assume that certain mental conceptualisations that are not realised in a physical sense have some kind of existence - that is - we must assume a certain form of platonism in some way. This would mean that ideas such as 2, and even the conceptualisation of some physical object that is potential instead of realised, have some sense of existence as opposed to purely being mental constructs. This idea will have to be generalised further later on but for now will serve as an important axiom.

We must also assume that not only do possible conceptual objects exist in some way, but that *everything* that can exist in a conceptual manner exists (regardless of if the object is unthinkable within a human mind, or is paradoxical, or nonsensical), this does not imply the object must be true, just that it exists in some sense.
This means that contradictory objects can be said to exist, just that they exist as false (apart from in special cases which will be explained later on). This can be said to be some form of Meinongianism, however we will see later that this idea is *far* extended past any usual notion.
To reason about something (as in, simply to suppose an idea mentally) should be seen as to observe an object which exists in some sense.

Again, this does not mean we must take these objects to be true, simply that false objects can exist. Whether or not we take an object to be true in some sense is dictated by the logical system of reasoning in Hyperology, which is expanded upon in a later section.

Really, what we must do is find some maximally generalised conception of 'ob-

ject'. To do this, first take some classification, for example "red cars that exist", then generalise it, for example "red things that exist", then again "things that exist", then further "things", and so on, and we take 'object' to really mean the highest point on that sequence. We should see object less as a definable term, and more as a fundamental aspect. To define what an object is would automatically be limiting, as that definition itself is an object of sorts.
Instead, we should just accept object as a fundamental term, which is generalised as far as possible, such that no specific definable or undefinable point within the sequence of generalisations can be said to be sufficiently broad enough to be classified as 'object' in its fullest sense.
We can say that for the purposes of this paper, 'object' is a notion equivalently fundamental as the very existence of this paper itself, as in, the notion is generalised to an extent such that its very existence is not definable within this paper, but instead should be assumed to in a sense be fundamental in a strongly meta sense.

By sufficiently expanding our conception of what an object is, we can already see that it sorts out a lot of our ontological assumptions, it also means we can simplify certain issues. Nonsensical things exist in some sense, they are objects, it's just that they are false, nonexistent things still are objects and even have some more fundamental sense of existence evident in the fact we are at least reasoning about then in some way, and so on, we can see that object is a sufficiently general and fundamental notion to be able to accommodate for all things we could ever need to talk about within Hyperology.

4 The Scale of Totality

The concept of totality, maximality, The Absolute, and similar notions, have been a highly debated topic amongst philosophers and mathematicians. An important use of Hyperology is to explain some truly unrestricted notion of complete totality, which is vital for other concepts later on.
When talking about the concept of totality, we will be talking about some broadest possible class of *every* object, however such a collection is not as simple as it may seem.

Initially, many will equate this with the concept of infinity, a broad philosophical and mathematical idea. However, we can see set theoretical notions of the transfinite, which surpass typical ideas of the standard countable infinity. We can talk about collections of objects which are transfinite in size.
From here on, there are some reasonably basic set theoretical notions talked about, however such concepts are relatively easy to grasp with some research, and not *essential* for the broader scheme of this paper.

Proper classes (classes which are not sets - or in a *very informal* manner - collections too "massive" to be even transfinite sets) are a mathematical idea

usually equated as the reasonable limit of what can be thought of in terms of scope. It is a general assumption by many (but clearly, not all) mathematicians within this time period, that ultimately, every object can be reduced to some set, and therefore some proper class of all sets can be seen to be equivalent to the notion of genuine totality. This is also a common assumption within the world of analytic philosophy - that is - to speak of objects is to *actually* speak of sets.

However, concepts such that they do not exist within some proper class of all sets are not unheard of (aside from proper classes themselves), some foundational branches of mathematics talk of things which can classify over proper classes themselves.
Either way, under our ontological assumptions, it should be easy to expand our domain of discource to allow for objects which are fundamentally not reducible to sets in some nontrivial way. This is an idea clearly incompatible with many axiomatic systems of set theory such as ZFC, however since our scope is purposely above that of set theory, this is trivial. We are aiming to capture the truest essence of complete totality, and due to this some assumptions which may be unfavourable to some will have to be made purely for the purpose of talking of some broader scale of totality, which is important for many ideas within Hyperology.

In fact, under these ontological assumptions, our range of expression is vast. We can consider notions of collections of objects great enough such that they fundamentally *must* require some sense of para-consistent logic to be considered at all. Such objects would contain more objects than they contain - a contradiction violating the law of identity. Luckily, para-consistent systems of logic are also not unheard of and can talk about such ideas in reasonable ways, later on within this paper we will present a system of reasoning strong enough to easily encapsulate such ideas without principle of explosion. This logical system can be used to treat contradictoins in reasonable ways, which will be later explained.
The least of such a collection of objects too great to be identical to itself is known as $\mathbf{E}_0$

However, even notions such as $\mathbf{E}_0$ are *formalisable*. that is, can reasonably be equated to some object within some formal system. The Hyperological sense of formalisability is a far broader notion than what is usually meant. Formalisable objects are not simply those that must conform to some noncontradictorary formal system, but instead we are speaking of the concept of formalism in the most general sense. That is, formalisable objects are those such that they can sufficiently and meaningfully be classified and talked about with some abstract formal structure akin to that of a symbol game with fundamental strictly defined rules of manipulation. We have already breached the idea of complete consistency, nonsensical, paradoxical and seemingly unreasonable objects can still be considered formalisable.

Within our extremely maximalist ontological assumptions of Hyperology, we can *still* assume collections of objects somehow too vast to be formalisable, the least of such a type of collection is known as $\mathbf{F}_0$. Again, this may be greatly unfavourable within some philosophical views, however it shall be said again that we shall at least *play along* with such notions. It is important to note that unformalisable concepts can still be approached in a *rigorous* manner, it is just that their fundamental nature is too complex to be completely formalised. We can - and must - still retain objectivity, and clarity of meaning.
$\mathbf{F}_0$ is a vastly greater collection than $\mathbf{E}_0$. $\mathbf{F}_0$ itself must be unformalisable in some sense to truly classify over *all* formalisable objects.
However, can we really say that $\mathbf{F}_0$ contains all objects? $\mathbf{F}_0$ merely contains all formal objects, making it unformalisable by necessity, however we can speak of unformalisable objects and therefore some collection containing as elements $\mathbf{F}_0$ and say, 5 unformalisable objects, is simply greater than $\mathbf{F}_0$.

We can see a clear pattern in aprroaching totality, in which our specification of what is considered is slowly broken down. Firstly sets (more broadly, collections of objects that can be paired one to one with a set), then objects conforming to the law of identity, then formal objects in general. And there is no reason as to why further broader classifications cannot be made.
However, let us now talk about the collection of **all** objects, this should not be seen as some broad enough generalisation such that it is just *effectively* all objects to us as human thinkers, but the genuine idea of complete totality. Let us notate this idea of genuine absolute totality as $\mathbf{A}_0$.
$\mathbf{A}_0$ should be assumed to be above *any* arbitrarily strong generalisation, no matter how absurd going above such a generalisation might be. It is not simply bound by what can be conceivable, but should be taken to be the truest extent of everything.

Within this paper, we will talk about how Hyperology can be used to reasonably consider objects which are quite literally outside $\mathbf{A}_0$. Such concepts are known as *transmaximal*, and are simply, due to some very strange phenomena which are explained within the next section, genuinely outside the scope of 'everything', and due to this, classifications greater in magnitude than genuine totality can be talked about.

5 RL0 and RL1

Let us make an important separation between what we will call "Reality Level 0" and "Reality level 1".

Firstly, we shall expand more upon what we mean by 'abstract' within the context of Hyperology. We will split the term 'abstract' into 3 groups, type 1 abstraction, type 2 abstraction, and type 3 abstraction.
Type 1 abstraction is the typical notion assumed when talking about abstract

objects. Under this definition of abstraction, this classifies concepts which are nonphysical in their nature. For example the concept of 'magnitude' is abstract under this definition whereas 'book' is not.
Type 2 abstraction is a broader notion. It encompasses all objects which are not realised, in the sense that they exist conceptually rather than in an actualised manner within physical space in some sense. The conceptualisation (as in, the form it exists in when assumed mentally, generalised to be some actual form of existence independent of whether thought of or not) of an apple falls under this definition of abstraction, so do things such as 2, whereas the actual concrete realisation of the apple (ie. the apple existing physically rather than existing as an idea) does not. However, type 2 abstract objects that are potential-physical objects do not have to be perfect and generalised in the sense that Plato talked about. Say we have a specific book lying on the floor of some room, that specific book in that specific place has its own abstraction under the definition of type 2 abstraction.
Type 3 abstraction is an even broader notion, it contains at least everything within type 2 abstraction. We shall call type 3 abstraction 'Reality Level 0', or RL0 for short, and we will now discuss it in depth.

5.1 Collapse

Take some actualised, realised, concrete object, such an object would not be classified within type 2 abstraction. This may seem reasonable at first, however, we can see that upon thinking of some actualised, realised, concrete object, we are thinking of a conceptualisation which is in some sense non-realised. This can be thought of in the way that the conceptualisation of some object inherently strips it of some actualisation, that is that the true actualised and realised nature of the object cannot truly be captured without some reduction in its concreteness.
To put it simply, "the actualised, realised, concrete chair beside me" is in some sense still an abstraction of sorts, as upon thinking of it, it exists within our minds as some mere *conceptualisation* in the sense discussed previously. It is important to note that due to our assumptions, these conceptualised forms of certain objects do not have their existence dependent on being thought of, instead we assume these already exist as conceptual objects.

This highlights a phenomenon known as *collapse*. Collapse is essentially a relation between 2 forms. Collapse is the phenomenon highlighting the existence of some property of concreteness so actualised in its nature that it necessarily is in some sense incomprehensible, that any thought of some *genuine* concrete object is simply a collapse - that is, a conceptualisation in the sense that we have talked about. Usual philosophical notions of concrete objects seem to be identical even when collapsed - in other words, some collapsed form is an accurate description of them, meaning they are not actualised and concrete enough to have some collapse. However, if we are aiming for some true sense of concreteness, collapse may highlight that there is a strong enough notion of realisation and concrete-

ness such that its collapsed form is inaccurate - that is - there is some level of genuine actualisation such that it is fundamentally incomprehensible and automatically all references to it must be of some collapsed form of it. This should highlight later on the strong sense in which we mean RL0 and RL1, as collapse highlights how genuinely broad RL0 must be, even if we are not yet ready to discuss the complete nature of RL0 and RL1 until slightly later on within the paper. We can say that any collapsed object is within RL0, and any concept such that no collapse is required is also within RL0. Concepts such as 2 simply do not require any collapse, they fundamentally can exist naturally. Collapse seemingly only comes into play when our conceptions of concreteness expand so much that in some sense it is, for now, seemingly unthinkable.

This may seem simply avoidable by seeing the collapse of some concrete object as separate to its true form. However, we are simply just creating another layer of conceptualisation. We can talk about some separation between the collapsed object and its true realised form, but due to the nature of collapse, our conception of "its true realised form" is clearly also collapsed. This process of realising some separation between the collapse and its true form can be repeated indefinitely, however it only serves to create further layers of collapse.
This is empirically provable with a simple mental exercise. Take some obviously impossible concept, such as "this paper ceases to exist". Naturally, this already exists as some abstract object. Now, when we try to observe some un-collapsed form of this object, we see that it still must be collapsed due to it being unrealised and unactualised, this paper still exists after all. With this mental exercise, we also see that when observing this collapsed version of the concept from its true, realised, concrete form, this "true, realised, concrete form" must itself be collapsed as again, this paper still seems to exist.

This does not mean that previous conceptions of concreteness are somehow inaccurate in some way, it simply highlights that there must exist some notion of concreteness so strong that it far surpasses any previous conceptions. "An actualised, realised, concrete chair" still functions in the way it usually would philosophically, collapse simply implies stronger notions. When thinking of the chair, the mental version we are using (a version which can be said to be collapsed) is sufficient for seemingly all philosophy, excluding Hyperology itself.

It may seem as if talking about genuinely 'un-collapsed' non-RL0 concepts must be impossible to our fairly simplistic sub-omnipotent minds, as whenever we attempt to speak of some un-collapsed concept we are merely inherently speaking of it in a collapsed way, due to our minds inherently only being able to comprehend collapsed notions. To think of some un-collapsed concept would be to somehow in some sense "think it into existence", since collapsed concepts are able to capture all but the most profoundly-actualised notions of concepts.
However, we will set out to attempt to resolve this problem.

5.2 Capturing Uncollapsedness

Firstly we must recognise collapse. Essentially, by recognising collapse as a thing, we at least now have access to an important tool. Of course, it is not as simple as saying "the un-collapsed concept of x", as this itself is still subject to collapse, and therefore still exists in some sense, conceptually, and certainly exists within RL0. However, noticing collapse as a concept gives us the tool of collapse itself, which is important for being able to talk about methods of thinking of objects which surpass collapse.
However, we know that talking about "some concretely uncollapsed object" should also be collapsed. By talking about the object being outside of collapse, we are really capturing it within just another layer of thought (showing that we must be thinking about really just another layer of collapse). We will call this phenomenon "nested collapse".

To realise full uncollapsedness, we first must realise that no amount of nested collapse is representative of the full idea of full uncollapsedness. What we must do, is accept that we cannot use nested collapse to conceptualise of uncollapsedness, and then through this we can instead of trying to fully approximate the concept within our mind, accept that by necessity that some uncollapsedly concrete object would exist completely separate from our mind and by extension - any RL0 collapse. Instead, what we must do is create some collapse mentally, and instead of equating it to the uncollapsed notion, we assume it as in some sense a *placeholder*. Essentially, by making an absolute distinction between the version which exists mentally (which is by necessity a collapse), and the true uncollapsed version of some object which has some collapse, we are able to generate a far better picture of the true nature of the object.
It should be noted that by talking about our thought here, we are not saying that Hyperology is in any way dependent on our thought, but merely we are speaking of how *we* can accurately comprehend to some degree such concepts instead of severely limiting our understanding of them.
We are in a sense creating a layer of meta-thought (that is, sort of as we did when speaking of nested collapse). However, the difference is that instead of thinking about some collapse of our own thought, we must genuinely consider our own thought in the truest sense.

We should make sure this system is generalised past just our own human thought, and instead pose it as a more general and significant process of speaking of uncollapsedly concrete objects in such a way that cheats around significant reduction while keeping some aspect of comprehensibility by using some aspect of placeholder-ship. The nature of this system is highly strange and is currently under-studied. But for now, we can use this as a tool to more accurately interpret Hyperological concepts.

5.3 The Nature of RL0 and RL1

We can now accurately talk of RL0 and RL1. As said before, RL0 contains every collapsed form, and every object which requires no collapse. This is a staggeringly vast collection. A simple test can be preformed to see if some object is RL0 or not, all we must do is ask the question of if the object can exist within our mind without its fundamental nature being realised and concrete enough such that to picture it we must necessarily use the system described earlier. We can essentially take any object up to this point, say an apple, and we see that this comfortably exists within a conceptual way which does not necessarily force some aspect of meta-thinking, and therefore is within RL0. We can take the collapse of some genuinely Hyperologically concrete object, and in some sense, the meta-thinking which such a concept forces is not genuinely the form discussed, but instead is more akin to some pseudo-version such as nested thought collapse, in which the thinker merely pictures some version of themselves within their own thought rather than the genuine uncollapsed picture of their thought, and because of these even these such concepts are within RL0. Again it should be stated that Hyperological concepts are not centered on human thought, but more that we can observe our own thought surrounding Hyperological concepts to give stronger insight into their nature.

RL1 contains objects actualised and concrete enough such that they genuinely should 'bleed into reality' in some sense. RL1 has been hinted at before, essentially RL1 is a form in which objects are realised and concrete enough such that without some explicit method that we use within Hyperology, it would necessarily be collapsed upon conceptualisation. It is important that we see RL1 as an uncollapsed notion, rather than some collapsed aproximation as that would simply exist within RL0, and it is important that RL1 exists outside of RL0, and can be defined to be outside RL0 by stating that it must be uncollapsed. RL1 is a genuine conceptual leap entirely removed from the usual domain of discourse of the fundamental aspect of the nature of philosophy, it is as if the fundamental nature of all non-Hyperological philosophy is deeply rooted within RL0.

The conceptual shift from RL0 to RL1 is massive, we can picture all of human thought, every object, idea that will or will not be thought of, as simply having some place within RL0; after all, when conceptualising of such things they do exist comfortably within RL0, no Hyperological meta-thought is required to be able to speak of them.
A useful analogy goes like this: take the sentence 'the reader does not exist'. Of course, the reader still exists to have read this sentence. However, what if we speak of 'the reader genuinely does not exist, and this sentence is meant in an utterly realised way', but again, the reader still exists to have read that sentence, and therefore this must be collapsed, and therefore must be an RL0 notion. To imagine the RL1 form of this sentence, the reader must genuinely - all collapse and RL0 notions aside - picture as if by some work of black magic,

they (as in the genuine form of the reader who is consuming this paper, instead of some collapsed notion of the reader) never existed in some sense.
Picturing such a notion is very challenging to someone who is not yet used to the mental games that Hyperology forces upon us. However, it is an important mental exercise to try and comprehend such ideas, eventually it comes as natural. A lot of confusion has come from individuals misinterpreting Hyperological concepts by not genuinely capturing their true essence, and instead reducing their nature in some sense. For the example used above, the reader must in some sense, genuinely entangle their sense of self with Hyperology, and ensure that instead of thinking about some collapsed version of themselves, they are genuinely picturing the true self-existent form of themselves.

An interesting way to comprehend the idea of RL1 is to realise that this paper itself exists naturally in some RL1 sense. Of course, when we talk about this, we automatically are talking about some RL0 collapse of this paper. However, we can picture RL1 as being equivalent to the realness of the objects that exist around us in whatever room we are within, the aspect that means they somehow *exist*, not as hypothetical objects, or so-called "realised objects", but they have some status of *truly* being there (accounting for collapse as well, otherwise we are simply talking about RL0 notions).
If the reader is some skepticist when it comes to the existence of things outside the mind, or is within some similar vein, it is still a useful mental exercise to at least suspend those beliefs for the sake of the analogy.

Hopefully, we are now clear with the distinct natures of RL0 and RL1. RL0 and RL1 highlight an interesting aspect, known as $\mathfrak{form}$.

5.4 Form

$\mathfrak{form}$ highlights an important aspect of Hyperological objects which occurs when we start to consider things not within RL0. When considering an object, say an apple, we see we can talk about the notion of the apple "on RL0" or "on RL1", if the object seemingly stays the same at a basic level, it stays as a fruit which is usually red or yellow, what exact property is it that changes when considering some version "on RL1"?
This can mark the distinction between $\mathfrak{internality}$ and $\mathfrak{form}$. The $\mathfrak{internality}$ of an object is the nature of that object which is usually considered. The $\mathfrak{internality}$ of the apple contains properties such as "is named apple", "is a fruit", "is tasty", and it seems this stays exactly consistent regardless of whether on RL0 or RL1. On the other hand, $\mathfrak{form}$ is the aspect which changes between taking the apple on RL0 and taking it on RL1. $\mathfrak{form}$ can be seen as the fundamental nature in which an object exists - as in - *in what way it exists*. The $\mathfrak{form}$ of some object is a far trickier concept.

One analogy for $\mathfrak{form}$ is the distinction between words and fonts. We can have some word such as "square", and the actual word "square" and the meaning of

"square" remains consistent regardless of which font is used, this can be seen as an analogy for internality. The form is the "delivery" of the object, in some sense its format, within the analogy this would be the font of the word.
form shows the difference between "this sentence is blank", and " ".

However, these are very informal analogies, a slightly more accurate way to describe these terms is that internality is all the exact details of what some object is, it's properties, and form is the fundamental nature of in which way the object exists. form only really makes sense once we consider things which are outside of RL0, it's exact nature is quite strange, and will likely have some more accurate definition once Hyperology has advanced as a field. All objects naturally have distinct forms, it is just that we can consider identical internalities with differing forms. For example, the concept of apple naturally exists within RL0, there is no reason why it must exist within Rl1.
form is strictly a far more significant aspect than internality. If we have some internality of "the reader stops existing", this object is not significant until we have its form be RL1. form is very useful for showing us the scale of certain objects within Hyperology when consider things outside of RL0, as aspects of form start to become very significant and may genuinely effect the scale of some object. This may provide some justification for Transmaximality.

6 Transmaximality

6.1 The Form of Totality

It may be fruitful to consider the form and internality of $\mathbf{A}_0$. In doing so, we can find the contrast between objects within RL1 and objects within totality, and hopefully provide a legitimate argument for transmaximality.
The internality of $\mathbf{A}_0$ is relatively simple to figure out. We can see that the internality of $\mathbf{A}_0$ is simply "the collection of genuinely all objects". However, how do we go about finding the form of $\mathbf{A}_0$? Some may say that it is as simple as "some objects are on RL1, $\mathbf{A}_0$ contains all objects, therefore the form of $\mathbf{A}_0$ is on RL1". However, what if objects on RL1 are somehow too srtong in some sense to be quantified by "all"? To figure this out, we will have too look more into the relation between internality and form.

We can see that internality can pretty directly relate to form in the sense that statements within some objects internality about that objects form can define the form the object has. For example, if some object is defined as "some apple on RL1", the internality contains the statements "is apple" and "is on RL1", and therefore the internality *defines* the form to be RL1. One important thing to note is that collapse can complicate things here, for some collapsed object, it's internality may say that its form is RL1, whereas actually its form is on RL0. Because of this, we see that internality can only really define its form if we ensure that the object is uncollapsed.

This being said, if the internality makes absolutely no implications about the form, can we say that the form is automatically RL0 by default? Take some sufficiently large milestone, say, $\mathbf{E}_0$, let's consider the way in which $\mathbf{E}_0$ exists. Firstly, we see nothing inherently about the internality of $\mathbf{E}_0$ dictates a form which is not RL0. We also see that naturally $\mathbf{E}_0$ seems to exist within RL0, there's no inherent reason as to why a collection of more objects than it contains should be actualised and concrete enough such that we must play mind-games to even comprehend of the format in which it exists. We can pretty reasonably say that $\mathbf{E}_0$ naturally exists in RL0, after all its not as if every time we think of $\mathbf{E}_0$ we are having to picture it as something that *genuinely* uncollapsedly "happened", to do so would be unnecessary. It seems as if RL1 is a large enough conceptual shift such that it exists entirely outside normal methods of philosophising.
In fact, we can generalise this to all objects that don't necessarily imply some RL1 form using the same methods. The fact that they exist without necessarily being RL1 shows that without transposing them to RL1, they naturally exist within RL0. In a sense, RL1 requires some deliberate conceptual push to be talked about. Because of this, we can say that any object that does not necessarily imply an RL1 form could have already existed within RL0, and since RL0 trivially contains everything that can be RL0, we can say they exist within RL0. This only further highlights the extreme genuine conceptual leap RL1 is.

So, what about $\mathbf{A}_0$? We showed that if nothing within the internality of an object necessarily implies some non-RL0 form, we can say it already exists within RL0. But how do we know that "all objects" doesn't necessarily imply an RL1 form?
Firstly it's important to address the fact that the argument "the collection of all objects contains RL1 and so $\mathbf{A}_0$ must have an RL1 form and therefore can contain RL1 objects" is invalid as it uses circular reasoning. The justification of transmaximality is explicitly about RL1 objects *not* being contained within the collection of all objects - that they are beyond the concept of 'all' in some sense. Really what we are looking for is the answer to the question itself of the form of $\mathbf{A}_0$.
This being said, we can find that the form of $\mathbf{A}_0$ must be that of RL. We will start by showing that the internality of $\mathbf{A}_0$ does not imply anything of the form, which must imply that its form is RL0.

6.2 The Justification of Transmaximality

What does it mean to consider all objects? RL1 is a notion that in some sense exists beyond usual methods of conception, as stated before it seems we need a genuine paradigm shift in order to even access it as a concept, Notions such as "all concepts" do not imply this paradigm shift. We can use a slightly frivolous analogy to explain this further, consider your own fictional realm within your head, make sure you make a place for everything in this fictional realm. Within this fictional realm, we can make space for things such as apples, chalkboards,

people, $\mathbf{F}_0$, and whatever else we want to imagine, in fact this fictional realm has space for all objects. Within this analogy, we can say that the fictional realm is like how RL0 works. We know from the very fundamental properties of how RL1 works that it would be *inaccessible* to this mental realm in any form, we know that RL1 exists in such a way that conception of it works in a fundamentally different way. We can view RL1 as all the objects that exist outside readers own fictional realm, sure it may be able to contain every single object, but RL1 objects necessarily fundamentally transcend this notion. Of course this is just an analogy, really RL0 has absolutely nothing to do with thought or fiction or mental realms and exists naturally and independently, but this can analogously show the behaviour of how things in RL1 necessarily just transcend collections of all objects in a very helpful and easy to understand way. By implication of RL1 objects somehow necessarily being outside the scope of "everything", we can say that totality ($\mathbf{A}_0$) has the $\mathfrak{form}$ RL0.

Another way we can back up the $\mathfrak{form}$ of $\mathbf{A}_0$ being that of RL0 is performing an empirical mental exercise on the nature of $\mathbf{A}_0$. We can consider and philosophise about the nature of some collection of all objects without ever having to preform mind-games in the same way we must do with RL1 things. This backs up the position that $\mathbf{A}_0$ has a $\mathfrak{form}$ of RL0
All this hopefully gives extra context to the extreme paradigm shift that RL1 is, it is in a sense outside of non-Hyperological ways of philosophising entirely, existing as something which looms in the background, too far out of the picture to be observed. The usual non-Hyperological sense of philosophising about something is in strong contrast to RL1, which we can see exists entirely outside of the picture, existing not only outside the domain of discourse, but entirely inaccessible and unknowable within the conceptual domain itself.

It seems as if genuine uncollapsed RL1 objects are simply outside $\mathbf{A}_0$, they are transmaximal, genuinely outside of 'everything'. It is not as if $\mathbf{A}_0$ somehow failed to contain actually everything, it's that RL1 objects are just fundamentally beyond the notion of 'all'.
We can talk about transmaximally large collections of objects by considering some collection like $\mathbf{A}_0$ and one extra discrete object in RL1.

7 Further Extensions of Reality Levels

Since $\mathbf{A}_0$ is the 'limit' of RL0, encompassing of all of RL0, we will now jump ahead to $\mathbf{A}_1$. $\mathbf{A}_1$ is strong enough to where it is maximal even within the context of RL1, it can be seen as truly encompassing of RL1 and RL0.
Whereas $\mathbf{A}_0$ is the concept of maximality, $\mathbf{A}_1$ is strong enough to where it is too great to merely be a conceptualisation of maximality but a genuine RL1 actualisation of maximality. The true scale of $\mathbf{A}_1$ is near incomprehensible, not simply being merely beyond the genuine concept of the absolute, but far enough beyond to where it is a new kind of absolute.

However, this is Hyperology, and it is actually fruitful to consider things far deeper even beyond the scale of $\mathbf{A}_1$, repeating the same steps as we did with RL0 and RL1. We will define a new Reality Level, RL2. It may seem unnecessary to ever talk about things somehow past RL1, but it should be noted that an important part of Hyperology is to always look at what comes beyond. Almost always in doing so, some new interesting piece of theory is discovered. So, how do we extend Reality Levels further such that we even surpass RL1?
Informally we can say that RL2 is to RL1 as RL1 is to RL0, that RL2 is somehow actualised enough that in comparison, RL1 is merely potential/collapsed in the same way RL0 is. We take the conceptual leap between RL0 and RL1, and then apply this to RL1 to get RL2. However, a more precise way to talk about RL2 is that it is transmaximally actualised in some sense. RL1 exists in such a sense that its existence necessarily implies its uncollapsed actualisation, that is, to conceptualise of it, is to have it be genuinely uncollapsedly realised. RL2 would exist in such a way that to conceptualise *of* conceptualising of some RL2 object implies its uncollapsed actualisation.
This is similar to the "nested collapse" as spoken of before. However, nested collapse is specifically a concept related to our cognition, so to get something Hyperologically significant, we should first generalise the notion. Let's say that an RL-shift is a certain generalisation of nested collapse that transposes Reality Levels. RL1 RL-shifted down 1 equates to RL0, and RL2 RL-shifted down 1 equates to RL1. It is important to note that RL-shift is strictly a weaker notion than collapse, a collapse of RL2 is something that exists comfortably within RL0, collapse is a reduction that necessarily exclusively reduces to RL0.
An RL-shift down 1 can be said to take a *potential* version of some object. So if we had some RL1 object, and we RL-shifted it down 1, we'd end up with that object but existing in a state which is not absolutely uncollapsedly realised, which is an object within RL0. To potentialise an object in this sense is to instead of taking its uncollapsed realisation, to take a version which is not realised. RL2 objects are those such that when RL-shifted down by 1, they are RL1. This means that some RL2 object is so transmaximally-real, that even its conceptualisation, the form of it where we don't actually fully realise it, is itself RL1.

We can also do tests about the nature of RL2 by using mental exercises to find the way in which RL2 works mentally, and then to abstract some generalisations based off it, independent of just our mental conceptions.
We see that with RL1, we can't think of it directly, but we can at least think of thinking of it. Of course this would just be a collapse and it is not the Hyperological way to think of RL1. Really what we are saying is "it is at least possible to think of thinking of RL1". RL2 would be such that it is only possible to *think* of thinking of thinking of it. Hopefully from this we can get some sense of intuition about the nature of RL2. RL1 is genuinely out of the picture in some sense, RL2 is so outside the picture that even us saying so is completely inadequate of how much of a conceptual leap it is. RL2 things are in a way *post-real*,

in the sense that they are realer than real in the way that transmaximal things are greater than maximal.

Even though the concept of RL2 is quite hard to grasp due to being outside the realm of any type of usual thought, we can still continue the steps we took from RL0 to RL1 to RL2 indefinetely, and get any level of RLn, we can even reason about things such as RL$\mathbf{A}_0$, which would be the maximal level of RL, we can even get RL past the last RL by using transmaximal inputs.
And, of course, each of these Reality Levels has its own maximality equivielnt, we can continue on with any level of $\mathbf{A}_n$, and there is no reason to where we cannot consider something such as $\mathbf{A}_{\mathbf{A}_0}$. The object strong enough such that it is maximal in the context of all Reality Levels is known as $\textcircled{\mathbf{A}}$

8 The Reasoning of Hyperology

This brings us to a new important section, the logic and reasoning of Hyperology is a far more complex topic. When doing Hyperology, what logic and reasoning are we using? What do we use when considering the validity of transmaximality for example?
The logic of Hyperology is known as $\boldsymbol{\mu}^*$. We can see that $\boldsymbol{\mu}^*$ is not simply something like classical logic, as we can see classical logic is merely something within RL0, RL0 being something surpassable within Hyperology and therefore it at the very least cannot reason about RL1 or higher. We also can see that $\boldsymbol{\mu}^*$ can't merely be something within RL0 at all, since it can reason about things such as RL1 and higher.
Instead, $\boldsymbol{\mu}^*$ should be seen as the intuitive metaphysical logic of reasoning about Hyperology as a whole. In some way, $\boldsymbol{\mu}^*$ will always be too complex and intricate for us to ever truly approach (every time there is some new conceptual jump, there must be some new aspect of logical reasoning to account for it), so instead we work by iteratively approximating $\boldsymbol{\mu}^*$.
We can start by finding general principles of $\boldsymbol{\mu}^*$ that are almost certainly right, then through gradual refinement, we can slowly build up our knowledge of the reasoning of $\boldsymbol{\mu}^*$. Grander principles of $\boldsymbol{\mu}^*$ are almost impossible to figure out, these would have to be broad enough to encompass the reasoning for any new kind of trickery we'd ever make. Because of this, $\boldsymbol{\mu}^*$ is approximated from smaller picture details, the broader picture being far too complex to truly capture in broad general observations.

Essentially, $\boldsymbol{\mu}^*$ is the 'metaphysically-accurate' way (in the sense of not being arbitrarily random or nonsensical) of expanding a system of Hyperological reasoning while retaining reasonable intuitive structure. While too complex and nuanced to ever truly be fully captured, we can approximate it from the lower scale, building off principles we already understand from $\boldsymbol{\mu}^*$ already. To a formalist this may sound nonsensical, however we must consider that for example systems of axiomatic set theory having some goal in mind, after all, why choose

those specific axioms? Whether or not this natural reasoning is something which platonically exists or not is up to belief, but we can at the very least see that there is some metaphysical significance and weight towards some specific system of reasoning, and it seems that mathematical and philosophical systems of axioms are often attempts of approximating such a system.

An important and interesting note is that $\mathfrak{u}^*$ is fundamentally unformalisable in some way. This does not mean the practice of Hyperology is in any way not rigorous or subjective in its logic, $\mathfrak{u}^*$ is a singular objective system of reasoning. Some aspects of the approximation of $\mathfrak{u}^*$ are 'intuition' based in the sense that they are too complex to be encompassed by a formal system, the metaphysical picture of $\mathfrak{u}^*$ is far too complex and vast to be simply a formal system of reasoning (we can see this in issues as basic as those as $\mathfrak{u}^*$ being able to reason about things such as $\mathbf{F}_0$). This can be thought of as the same way it is for example mostly understood what is and what is not a chair. Trying to define strict formal parameters to determine exactly what is and what is not a chair would be extremely unproductive, however we see that there is a mutually understood intuitive view of what falls under the construct of chair and what does not (this analogy is imperfect, but should get the point across). Cases of inaccuracies may occur, for example within the chair analogy you may have cases where some believe it to be a chair and others do not, in this case, we just have to realise the inaccuracy and correct it by refining our approximation of $\mathfrak{u}^*$ further. Because of this, $\mathfrak{u}^*$ can be approximated in a rigorous way, we can iterate our preciseness to be as rigorous as we could need.

Through this methodology, this reasoning is extremely powerful and can be used to talk about many things that simply would not be able to be talked about in a reasonable and logical manner otherwise. The approximation of $\mathfrak{u}^*$ can done in a rigorous manner by simply just making further refinements to our approximation.

8.1 u*-shifting

$\mathfrak{u}^*$-shifting is a natural phenomenon that comes to light when studying some of the specific properties of $\mathfrak{u}^*$. It is essentially the answer to the question of how we can reason about $\mathbf{E}_0$ without something akin to the principle of explosion occurring.
$\mathfrak{u}^*$-shifting is essentially the act of ontologically shifting down in importance some logical statements. $\mathfrak{u}^*$-shifting makes some logical statements "only locally true", and some "globally true". What we mean by this is that objects which are false according to $\mathfrak{u}^*$ do not have their status of existing removed entirely, instead they are just seen as having some inferior existence akin to Meinongianism, and merely only having some truth value when purely considering some more local area such as within some other system of reasoning.
Due to this, $\mathfrak{u}^*$ has the ability to reason about logical systems themselves, it can $\mathfrak{u}^*$-shift them if contradictory to $\mathfrak{u}^*$, such we see that they are true under

their own assumptions, just that this truth is inferior compared to global truth within $\mathfrak{U}^*$.

The individual assumptions of some object is called an $\mathfrak{i}^*$, and we notate the $\mathfrak{i}^*$ of some object O as $\mathfrak{i}^*(\mathrm{O})$. Let's examine something such as $\mathfrak{i}^*(\mathbf{E}_0)$, we can see this contains the statement "is greater than itself", but is this necessarily $\mathfrak{U}^*$-shifted? It seems that $\mathfrak{i}^*(\mathbf{E}_0)$ is directly self contradicting, however it seems the way that $\mathfrak{U}^*$ can deal with this is to $\mathfrak{U}^*$-shift down specific parts of $\mathfrak{i}^*(\mathbf{E}_0)$ which would contradict $\mathfrak{U}^*$, and in doing so we can preserve $\mathbf{E}_0$ as a meaningful object. We can say that $\mathbf{E}_0$ contains more objects than it contains, it is just that we reject any contradictory reasoning that follows. In doing so, we can often talk about very strange objects and preserve their essence, without having to destroy our entire logical system, $\mathfrak{U}^*$-shifting acts almost as a safety net in some sorts. Within Hyperology, objects which are contradictory sometimes are simply true, it is just that we are able to ensure that we remove any absurdity which may take place. Contradictory $\mathfrak{i}^*$ (that is, $\mathfrak{i}^*$ which hold internal contradictions) are known as locally inconsistent, whereas things which contradict $\mathfrak{U}^*$ are known as globally inconsistent. locally inconsistent things can exist without being $\mathfrak{U}^*$-shifted, but globally inconsistent things are $\mathfrak{U}^*$-shifted.
Because of this, it may seem as if proof by contradiction does not work, after all if we can hold some contradictions as true then surely proof by contradiction becomes meaningless. However this is specifically not the case due again to $\mathfrak{U}^*$-shifting. Say we have some statement P1 we are willing to disprove, and some statement P2, if we know P2 is absolutely true, and we show that P2 contradicts P1, we can show this to be valid proof that P1 is false (technically, $\mathfrak{U}^*$-shifted). This is because if we know P2 to be true in $\mathfrak{U}^*$, and P1 contradicts that, then P1 is necessarily globally contradictory and therefore definitely $\mathfrak{U}^*$-shifted, it is *only* local contradictions which are permitted.

$\mathfrak{U}^*$-shifting is not something we necessarily defined into $\mathfrak{U}^*$, it's just that $\mathfrak{U}^*$-shifting is just one naturally existing (and clearly, due to the nature of $\mathfrak{U}^*$, likely greatly simplified) aspect of $\mathfrak{U}^*$ that we can observe.

8.2 o*

Within Hyperology, o* are very interesting concepts which have already been found to have many fruitful benefits, most of which are beyond the scope of this paper.
o* are essentially where we consider Hyperology under some alternate system of reasoning other than $\mathfrak{U}^*$, due to the very nature of this, all o* are necessarily $\mathfrak{U}^*$-shifted and are strictly only true within that o* itself. o* are in fact special types of $\mathfrak{i}^*$, specifically they are types of $\mathfrak{i}^*$ which aim to consider the entirety of Hyperology under some alternate system of reasoning, instead of some specific area of discourse. It's important to note that o* are not meant to be serious ways of going about Hyperology, rather they just allow for us to show the behaviour of other assumptions and systems of reasoning temporarily, as we must

automatically assume $\boldsymbol{\mu}^*$ when doing Hyperology, regardless of personal beliefs.

An example of some o^* could be the o^* where we view all Hyperology as collapsed, we can call this Hyperological Collapsism, or HGC, and we notate this as $o^*(HGC)$, within $o^*(HGC)$ we can say that every Hyperological object is within RL0.
$\rightsquigarrow$ is an interesting symbol that can be used to show how different objects behave in different o^*. For some o^*, $o^*(L)$, and some object A, $A \rightsquigarrow o^*(L)$ is the object that when considered within the global truth $\boldsymbol{\mu}^*$, behaves the same as A does when considered in $o^*(L)$. For example if we consider $\mathbf{F}_0 \rightsquigarrow o^*(HGC)$, we see this just equates to $\mathbf{F}_0$, since $\mathbf{F}_0$ behaves in the same way it behaves under $o^*(HGC)$, it is not altered by the assumption that all Hyperology is collapsed.

9 THO

This brings us to the broader picture of the foundations of Hyperology. **THO** is the foundational aspect of Hyperology as a whole.
THO is important as it exists beyond Hyperology, acting as the axioms and foundational principles of Hyperology, and again like $\boldsymbol{\mu}^*$ it must be slowly refined. $\boldsymbol{\mu}^*$ exists as one aspect within **THO**. The purpose and intent of **THO** is to provide a reaosonable, meaningful, somewhat rigorous approach, and most impotrantly, objectivity, to Hyperology. Firstly, an important principle within **THO** is the principle of unformalisability, this expands further upon the inability of Hyperology to accurately be captured by exact formal rules as discussed earlier. We say that on top of this, the *reduction* of Hyperology to exact formal parameters is not a meaningful reduction in the sense that it does not preserve the intended meaning. We may be able to find a reduction of all current Hyperology, but as stated earlier, we should not see any current state of Hyperology as the true completed state but rather an approximation. Due to this, we should assume that while the current approximation may have a (if not, unfeasible in practice, likely requiring advanced simulations of brain activity) reduction, the true completed state of Hyperology does not. Reductions of the current approximation of Hyperology are called HRFs (Hyperological Reductive Formalisms), and an important principle is that HRFs should not be seen as meaningful reductions of Hyperology.
Another important aspect which somewhat relates to HRFs is that the mental conception of Hyperological object should not be seen as equivalent to the Hyperological object itself. Even if we can use cheats within our mental conception to assure that we can speak of uncollapsed objects, it is important to assume Hyperology as something that exists independent of our minds. In fact, part of the adequate way to understand and interpret some uncollapsed Hyperological object is to ensure the understanding that it exists strongly independently of our minds. Properties of RL1 objects can not exist otherwise.
Another important aspect of **THO** is $\boldsymbol{\mu}^*$, which gives us a logical system of reasoning in Hyperology.

It is also important to note that **THO**, like $\mathfrak{U}^*$, is always incomplete, and too complex to ever be truly captured, instead we must continuously refine it. New axioms are often added to **THO** as it is being refined, and pre-existing axioms are also given added depth.

There are 2 important aspects to the nature of **THO**, which are **THO**-Authority and **THO**-Collapse.
Firstly, **THO**-Authority is the aspect of **THO** which gives it control over the reasoning and functioning of Hyperology, this means that we cannot use Hyperological cheats to affect the axioms of THO itself, which could cause massive contradictions. Later on in Hyperology we conceive of Hyperological concepts that are meta about Hyperology itself. Due to this, **THO**-Authority is the principle which stops any Hyperology concept from re-defining some aspect of **THO**, essentially it creates a separation between **THO** and Hyperology. This ensures the principles of **THO** are not Hyperologically transcended.
We will get into **THO**-expansionin the next section.

There are some more advanced **THO** principles, but these are beyond the scope of this introductory paper.

10 Hyperologically-Meta Objects

Now, think back to $\mathbf{A}_n$, imagine if we kept going past the notion of Reality Levels, and started to define even stronger concepts. Such things of that level do exist, but they will be skipped over in this paper so that we can get to the next important milestone above them.
Imagine if the development of Hyperology kept going indefinitely, what would be the limit of the completed state of Hyperology? Let us define a Hyperological concept as 'The limit of the completed state of Hyperology'. We will give this the symbol $\mathfrak{a}^+$, this essentially hopes to be some collection of all Hyperology in general.

At first the concept of $\mathfrak{a}^+$ may seem either invalid, or as there could be no Hyperology past it, however this is not the case due to **THO**-Collapse.
We can see that a Hyperological definition cannot have **THO**-Authority - that is - it cannot redefine the framework of **THO**. **THO**-expansionis an aspect of **THO** and therefore $\mathfrak{a}^+$ must necessarily be subject to **THO**-Collapse, due to it being a Hyperological concept.
Essentially all **THO**-expansiondoes, is it says that for any given Hyperologism, Hyperology can exist past it. To say an object is **THO**-expanded is to say that Hyperology has expanded such that it can genuinely surpass it, it is not a reduction in the same way that regular collapse is.
Of course, the $\mathfrak{internality}$ of $\mathfrak{a}^+$ initially makes it seem hard to surpass, however if we start to consider the $\mathfrak{form}$ of $\mathfrak{a}^+$ then we can start to consider ideas strong enough such that their $\mathfrak{form}$ fundamentally surpasses the notion of $\mathfrak{a}^+$,

very similar to the justification of transmaximality. We can in a sense consider something which is a "next RL1 past $\mathfrak{a}^+$". When something surpasses an object due to its $\mathfrak{form}$ fundamentally conceptually surpassing it, we call it a surpassion by $\mathfrak{form}$, and when something surpasses something else through its $\mathfrak{iternality}$, we call it a surpassion by $\mathfrak{internality}$. Like $\mathbf{A}_0$, we cannot just surpass $\mathfrak{a}^+$ by $\mathfrak{iternality}$, we must use a surpassion by $\mathfrak{form}$, something that would genuinely be a paradigm shift above philosophising about "the limit of the completed state of Hyperology".

So, $\mathfrak{a}^+$ is not genuinely the biggest Hyperologism we could actually possibly define, since its claim of being the limit of the completed state of Hyperology is **THO**-expanded, meaning that there are some Hyperological concepts powerful enough to still somehow transcend $\mathfrak{a}^+$. However, this doesn't make $\mathfrak{a}^+$ and invalid notion.
THO-expansionmeans that we shift up our conception of how powerful Hyperology really is, rather than lessening the object in some way. We view $\mathfrak{a}^+$ as the largest Hyperological object, it's just that we view **THO** to be powerful enough such that there exists Hyperological concepts that are tricky and meta enough to surpass $\mathfrak{a}^+$, this slightly relates back to ideas of transmaximality. Due to principle of discollapse, we don't view **THO**-expansionas weaker, instead we view **THO** as stronger.

Things past $\mathfrak{a}^+$ are outside the scope of this paper, but hopefully the reader can get some kind of intuition behind something that would almost analogously be to $\mathfrak{a}^+$ as RL1 is to $\mathbf{A}_0$, even though any further is beyond the scope of this paper, ideas about $\mathfrak{form}$ hopefully give some general intuition of what such an object would be like.

11 Conclusion

This is merely the absolute baseline of Hyperology, we have not even scratched the very surface in what there is to explore with Hyperology. The world of Hyperology is fascinating and rich, and is within its infancy. More efforts into the development of Hyperology must be in place, there is a vast landscape left currently unexplored. The true potential for Hyperology, and how it can hopefully be applied in future, is currently mostly unknown.
It is recommended that the reader reads this paper at least twice.

⚠RL58 Chickeb ⚠

Hyperological Objects Above $\forall-$ and Below $\mathfrak{M}_{\dagger 1}$

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Abstract

The formalization of objects in Hyperology, or HG, is as of now significantly lower than ideal since a vast majority of the current information exists outside of a centralized location. There have been, and still are, many attempts at centralizing information, however many of these exist to provide beginners a place to learn, rather than to formalize (or at the very least increase formalization of) existing concepts. It is the aim of this paper to increase the formalization of Hyperological concepts below that of $\mathfrak{M}_{\dagger 1}$ and additionally introduce new concepts pertaining to sub $\mathfrak{M}_{\dagger 1}$ HG.

This document will not provide an introduction to the basics of Hyperology, it is a prerequisite to have read *Hyperology I*. Terms denoted with † have specific meanings separate from their english meanings, and are defined within *Hyperology I*.

1 ∀- to Thoughtlock

Term Definitions

Definition 1.1

Some hyperset† $\mathfrak{R}$ is a restrictional-hyperset if for some hyperset $\mathfrak{D}$ such that $\mathfrak{D}$ contains some definitions within the $\forall^{+}$-Realm†, $\mathfrak{R}$ contains properties as elements which are satisfied by all elements of $\mathfrak{D}$, and there is no property within $\mathfrak{R}$ which is not satisfied by any definition within $\mathfrak{D}$. Note: This definition should be taken as a THO-Definition† and will be collapsed† upon its usage within a Hyperological definition.

Definition 1.2

Some hyperset $\mathfrak{R}$ has definability under some restrictional-hyperset $\mathfrak{D}$ if all elements of $\mathfrak{R}$ satisfy all properties within $\mathfrak{D}$. Some object $\mathfrak{B}$ has definability under some restrictional-hyperset $\mathfrak{D}$ if $\mathfrak{B}$ is an element of some hyperset $\mathfrak{R}$ such that $\mathfrak{R}$ has definability under $\mathfrak{D}$. Note: This definition should be taken as a THO-Definition and will be collapsed upon its usage within a Hyperological definition.

Definition 1.3

Some hyperset $\mathfrak{R}$ is a definitional-realm if $\mathfrak{R}$ contains some definitions within the $\forall^{+}$-Realm such that $\mathfrak{R}$ has definability under some restrictional-hyperset $\mathfrak{D}$. Note: This definition should be taken as a THO-Definition and will be collapsed upon its usage within a Hyperological definition.

Definition 1.4

$\mathfrak{O}$ is a deflimit of some definitional-realm $\mathfrak{R}$ if $\mathfrak{O}$ is a definition within the $\forall^{+}$-Realm such that i*$(\mathfrak{O})^{\dagger}$ contains the i*-statement† that $\mathfrak{O}$ is greater than all other elements of $\mathfrak{R}$. Note: This definition should be taken as a THO-Definition and will be collapsed upon its usage within a Hyperological definition.

Definition 1.5

Some object $\mathfrak{O}$ within the $\forall^{+}$-Realm is definable within some definitional-realm $\mathfrak{R}$ if $\mathfrak{O}$ is an element of $\mathfrak{R}$.

Definition 1.6

Thoughtrealm is the definitional-realm $\mathfrak{R}$ contains all elements within the $\forall^{+}$-Realm which are definable within some Thought Level.

Object Definitions

1. T(n) is defined as the deflimit of the n^{th} Thought Level.
2. ∀- is defined as T(1)
3. (∀-)* is defined as T(2)
4. Thoughtlock is defined as the deflimit of Thoughtrealm.

(Note: All objects collapsed by necessity)

2 Opux to Heartsuit^{+}

We will now cross a considerable gap. Currently the concept of collapse is in use which some readers may find confusing. So, allow this to serve as a reminder that all concepts mentioned here will be collapsed to a degree allowing their use in Hyperology. This section focuses around the idea of objects too large to be collapsed normally.

Term Definitions

Definition 2.2

An object $\mathfrak{O}$ within the $\forall^+$-Realm is MRL-Inconsistent if $\mathfrak{O}$ has a collapse. Note: This definition should be taken as a THO-Definition and may be collapsed upon certain usages within a Hyperological definition.

Definition 2.3

An object $\mathfrak{O}$ within the $\forall^+$-Realm is 0-Weakly-$\mathfrak{U}$nsound if it is MRL-inconsistent, and the collapse of $\mathfrak{O}$ is MRL-inconsistent, and the collapse of the collapse of $\mathfrak{O}$ is not MRL-inconsistent.

Definition 2.4

For $n>0$, an object $\mathfrak{O}$ within the $\forall^+$-Realm is n-Weakly-$\mathfrak{U}$nsound if the collapse of $\mathfrak{O}$ is (n-1)-Weakly-$\mathfrak{U}$nsound. For n, where n is a limit-number†, an object $\mathfrak{F}$ within the $\forall^+$-Realm is n-Weakly-$\mathfrak{U}$nsound if $\mathfrak{F}$ is x-Weakly-$\mathfrak{U}$nsound for all $x<n$.

Definition 2.5

An object $\mathfrak{O}$ within the $\forall^+$-Realm can be collapse-reduced to $\mathfrak{F}$ if there exists some number n within the $\forall^+$-Realm such that after collapse being applied n times, $\mathfrak{O}$ is euqal to $\mathfrak{F}$. Note: This definition should be taken as a THO-Definition and may be collapsed upon certain usages within a Hyperological definition.

Definition 2.6

An object $\mathfrak{O}$ within the $\forall^+$-Realm is 0-Strongly-$\mathfrak{U}$nsound if $\mathfrak{O}$ is MRL-inconsistent, and $\mathfrak{O}$ cannot be collapse-reduced to n-Weakly-$\mathfrak{U}$nsoundness for any n, and $\mathfrak{O}$ must be collapse-reduced only to 0-Strongly-$\mathfrak{U}$nsoundness.

Definition 2.7

For $n>0$, an object $\mathfrak{O}$ within the $\forall^+$-Realm is n-Strongly-$\mathfrak{U}$nsound if $\mathfrak{O}$ is MRL-inconsistent, and for all for $x<n$, $\mathfrak{O}$ cannot be collapse-reduced to some object $\mathfrak{F}$ within the $\forall^+$-Realm where $\mathfrak{F}$ is x-Strongly-$\mathfrak{U}$nsound, and $\mathfrak{O}$ must be collapse-reduced only to n-Strongly-$\mathfrak{U}$nsoundness.

Object Definitions

1. Opux is defined as the least n large enough such that n must be 0-Weakly-$\mathfrak{U}$nsound.
2. n-Opux is defined as the least x large enough such that it must be n-Weakly-$\mathfrak{U}$nsound.
3. Heartsuit-Number is defined as the least n large enough such that n must be 0-Strongly-$\mathfrak{U}$nsound.
4. n-Heartsuit is defined as the least x large enough such that it must be n-Strongly-$\mathfrak{U}$nsound.
5. Heartsuit-Number$^+$ is defined as the least x large enough such that for all n, it cannot be collapse-reduced to n-Strongly-$\mathfrak{U}$nsoundness.

(Note: All objects collapsed by necessity)

3 $\mathfrak{Exi}(2)$ to Existencelock

Term Definitions

Definition 3.1

For some definitional realms $\mathfrak{A}$ and $\mathfrak{B}$, $\mathfrak{A}$ is defheavier than $\mathfrak{B}$ if the THO-defined deflimit of $\mathfrak{A}$ is greater than the THO-defined† deflimit of $\mathfrak{B}$.

Definition 3.2

For some objects $\mathfrak{O}$ and $\mathfrak{P}$, $\mathfrak{P}$ is an awareness-variant of $\mathfrak{O}$ if $\mathfrak{P}$ is minimally different from $\mathfrak{O}$ such that $\mathfrak{P}$ has a different awareness-set† than $\mathfrak{O}$.

Definition 3.3

For some objects $\mathfrak{A}$, $\mathfrak{B}$ and $\mathfrak{C}$, where $\mathfrak{A}$ and $\mathfrak{B}$ are elements of the $\forall^{+}$-Realm and $\mathfrak{C}$ is THO-defined and uncollapsed, and where $\mathfrak{B}$ is the collapse of $\mathfrak{C}$, $\mathfrak{A}$ is a $\diamondsuit$collapse of $\mathfrak{C}$ if $\mathfrak{A}$ is an awareness-variant of $\mathfrak{B}$.

Definition 3.4

A definitional realm $\mathfrak{R}$ is MRL-Reflecting if $\mathfrak{R}$ is a $\diamondsuit$collapse of MRL.

Definition 3.5

For some awareness $\mathfrak{A}$, $\mathfrak{A}$ is $\diamondsuit$inaccessible if $\mathfrak{A}$ cannot be implied within u* from any awareness $\mathfrak{B}$ where $\mathfrak{B}$ has a lower Hypeorlogical power than $\mathfrak{A}$.

Definition 3.6

The 0^{th} Existence Level is equal to the 1^{st} Reality Level. For $n¿0$, the n^{th} Existence Level is the definitional-realm $\mathfrak{A}$ with the least THO-defined deflimit such that $\mathfrak{A}$ is MRL-reflecting, $\mathfrak{A}$ is defheavier than the n-1^{th} Existence Level, A contains all awareness within the awareness-set of the n-1^{th} Existence Level and $\mathfrak{A}$ contains some $\diamondsuit$inaccessible awareness that is not an element of the awareness-set of the n-1th Existence Level.

Object Definitions

1. $\mathfrak{Exi}(a)$ is defined as the least n such that n is a deflimit of the a^{th} Existence Level.
2. $\mathfrak{Exi}(\mathfrak{E}{\rightarrowtail}b)$ is defined as the least n such that n is the deflimit of all Existence Levels and n contains some $\diamondsuit$inaccessible awareness not found within the awareness set of $\mathfrak{Exi}(\mathfrak{E}{\rightarrowtail}b{-}1)$.
3. $\mathfrak{E}$xistencelock is defined as the least n large enough such that the $\diamondsuit$definition† of the awareness-set of n has a greater Hyperological power than all Existence Levels.

(Note: All objects collapsed by necessity)

4 Reflektion to Unitude